Universiteit
Leiden
The Netherlands

Bayesian learning: Challenges, limitations and pragmatics

Heide, R. de

Citation
Heide, R. de. (2021, January 26). *Bayesian learning: Challenges, limitations and pragmatics*. Retrieved from https://hdl.handle.net/1887/3134738

Version:	Publisher's Version
License:	Licence agreement concerning inclusion of doctoral thesis in the Institutional Repository of the University of Leiden
Downloaded from:	https://hdl.handle.net/1887/3134738

Note: To cite this publication please use the final published version (if applicable).

Cover Page

Universiteit Leiden

The handle https://hdl.handle.net/1887/3134738 holds various files of this Leiden University dissertation.

Author: Heide, R. de
Title: Bayesian learning: Challenges, limitations and pragmatics
Issue Date: 2021-01-26

References

Y. Abbasi-Yadkori, D. Pál and C. Szepesvári (2012). "Online-to-confidence-set conversions and application to sparse stochastic bandits". In: *Proceedings of the 15th International Conference on Artificial Intelligence and Statistics (AIStats)* (p. 245).

V. Amrhein, S. Greenland and B. McShane (2019). *Scientists rise up against statistical significance* (pp. 120, 156, 158).

S. Andersson (1982). "Distributions of Maximal Invariants Using Quotient Measures". In: *The Annals of Statistics* 10.3, pp. 955–961 (pp. 91, 108, 114).

A. Antos, V. Grover and C. Szepesvári (2010). "Active learning in heteroscedastic noise". In: *Theoretical Computer Science* 411.29-30, pp. 2712–2728 (p. 264).

J.B. Asendorpf et al. (2014). "Reducing bias due to systematic attrition in longitudinal studies: The benefits of multiple imputation". In: *International Journal of Behavioral Development* 38.5, pp. 453–460 (p. 7).

J-Y. Audibert and S. Bubeck (2010). "Best arm identification in multi-armed bandits". In: *Proceedings of the 23rd Conference on Learning Theory (CoLT)* (pp. 16, 206).

P. Auer, N. Cesa-Bianchi and P. Fischer (2002). "Finite-time analysis of the multi-armed bandit problem". In: *Machine Learning Journal* 47.2-3, pp. 235–256 (p. 206).

M. Aziz et al. (2018). "Pure exploration in infinitely-armed bandit models with fixed-confidence". In: *Proceedings of the 29th International Conference on Algorithmic Learning Theory (ALT)*. arXiv: 1803.04665 (p. 261).

A. Balsubramani and A. Ramdas (2016). "Sequential nonparametric testing with the law of the iterated logarithm". In: *Proceedings of the Thirty-Second Conference on Uncertainty in Artificial Intelligence*, pp. 42–51 (pp. 120, 152).

G.A. Barnard (1947). "Review of *Sequential Analysis* by Abraham Wald". In: *Journal of the American Statistical Association* 42.240 (pp. 93, 156).

G.A. Barnard (1949). "Statistical inference". In: *Journal of the Royal Statistical Society. Series B (Methodological)* 11.2, pp. 115–149 (p. 93).

G.A. Barnard and D.R. Cox, eds. (1962). *The Foundations of Statistical Inference: A Discussion*. Methuen's Monographs on Applied Probability and Statistics. London: Methuen (p. 24).

O.E. Barndorff-Nielsen (1978). *Information and Exponential Families in Statistical Theory*. Chichester, UK: Wiley (pp. 147, 184, 193).

A. Barron, J. Rissanen and B. Yu (1998). "The Minimum Description Length principle in coding and modeling". In: *IEEE Transactions on Information Theory* 44.6. Special Commemorative Issue: Information Theory: 1948-1998, pp. 2743–2760 (pp. 92, 112, 154).

A.R. Barron and T.M. Cover (1991). "Minimum complexity density estimation". In: *Information Theory, IEEE Transactions on* 37.4, pp. 1034–1054 (p. 177).

P.L. Bartlett, O. Bousquet and S. Mendelson (2005). "Local Rademacher complexities". In: *The Annals of Statistics* 33.4, pp. 1497–1537 (pp. 179, 183, 195).

M.J. Bayarri et al. (2012). “Criteria for Bayesian model choice with application to variable selection”. In: *The Annals of statistics* 40.3, pp. 1550–1577 (pp. 91, 100, 110, 143).

M.J. Bayarri et al. (2016). “Rejection odds and rejection ratios: A proposal for statistical practice in testing hypotheses”. In: *Journal of Mathematical Psychology* 72, pp. 90–103 (pp. 91, 99, 153).

G. Belot (2013). “Bayesian Orgulity”. In: *Philosophy of Science* 80.4, pp. 483–503 (p. 19).

D.J. Benjamin et al. (2018). “Redefine statistical significance”. In: *Nature Human Behaviour* 2.1, p. 6 (pp. 12, 120, 156, 262).

J.O. Berger (1985). *Statistical Decision Theory and Bayesian Analysis*. revised and expanded 2nd. Springer Series in Statistics. New York: Springer-Verlag (pp. 63, 78, 133).

J.O. Berger (2003). “Could Fisher, Jeffreys and Neyman Have Agreed on Testing?” In: *Statistical Science* 18.1, pp. 1–12 (pp. 132, 153, 155).

J.O. Berger (2006). “The case for objective Bayesian analysis”. In: *Bayesian Analysis* 1.3, pp. 385–402 (pp. 5, 69, 82).

J.O. Berger, J.M. Bernardo, D. Sun et al. (2015). “Overall objective priors”. In: *Bayesian Analysis* 10.1, pp. 189–221 (p. 112).

J.O. Berger, L.D. Brown and R.L. Wolpert (1994). “A Unified Conditional Frequentist and Bayesian Test for Fixed and Sequential Simple Hypothesis Testing”. In: *Annals of Statistics* 22.4, pp. 1787–1807 (pp. 153, 155).

J.O. Berger, L.R. Pericchi and J.A. Varshavsky (1998). “Bayes factors and marginal distributions in invariant situations”. In: *Sankhyā: The Indian Journal of Statistics, Series A*, pp. 307–321 (pp. 68, 70, 91, 107–110, 112, 123, 124, 142, 143).

J.O. Berger and T. Sellke (1987). “Testing a point null hypothesis: The irreconcilability of p values and evidence”. In: *Journal of the American statistical Association* 82.397, pp. 112–122 (p. 12).

J.O. Berger, D. Sun et al. (2008). “Objective priors for the bivariate normal model”. In: *The Annals of Statistics* 36.2, pp. 963–982 (p. 112).

J.O. Berger and R.L. Wolpert (1988). *The Likelihood Principle*. 2nd. Hayward, C.A.: Institute of Mathematical Statistics (pp. 61, 91, 94).

J.M. Bernardo (1979). “Reference posterior distributions for Bayesian inference”. In: *Journal of the Royal Statistical Society: Series B (Methodological)* 41.2, pp. 113–128 (p. 5).

J.M. Bernardo (1996). “The concept of exchangeability and its applications”. In: *Far East Journal of Mathematical Sciences* 4, pp. 111–122 (p. 6).

J.M. Bernardo and A.F.M Smith (1994). *Bayesian Theory*. Chichester: Wiley (pp. 4, 63, 79).

D. Blackwell and L. Dubins (1962). “Merging of Opinion With Increasing Information”. In: *The Annals of Mathematical Statistics* 33, pp. 882–886 (pp. 10, 30).

S. Bubeck, R. Munos and G. Stoltz (2009). “Pure exploration in multi-armed bandits problems”. In: *Proceedings of the 20th International Conference on Algorithmic Learning Theory (ALT)*. arXiv: 0802.2655 (pp. 205, 261).

S. Bubeck, R. Munos and G. Stoltz (2011). “Pure exploration in finitely-armed and continuous-armed bandits”. In: *Theoretical Computer Science* 412.19, pp. 1832–1852 (p. 206).

A.N. Burnetas and M.N. Katehakis (1996). “Optimal adaptive policies for sequential allocation problems”. In: *Advances in Applied Mathematics* 17.2, pp. 122–142 (p. 206).

G. de los Campos et al. (2009). “Predicting Quantitative Traits with Regression Models for Dense Molecular Markers and Pedigree”. In: *Genetics* 182, pp. 375–385 (p. 199).

O. Cappé et al. (2013). “Kullback-Leibler upper confidence bounds for optimal sequential allocation”. In: *Annals of Statistics* 41.3, pp. 1516–1541. arXiv: arXiv:1210.1136v4 (p. 206).

B. Carpenter et al. (2017). “Stan: A probabilistic programming language”. In: *Journal of statistical software* 76.1 (p. 263).

A. Carpentier and A. Locatelli (2016). "Tight (lower) bounds for the fixed budget best arm identification bandit problem". In: *Proceedings of the 29th Conference on Learning Theory (CoLT)*. arXiv: 1605.09004 (p. 206).

A. Carpentier and M. Valko (2015). "Simple regret for infinitely many armed bandits". In: *Proceedings of the 32nd International conference on Machine Learning (ICML)*, pp. 1133–1141. arXiv: 1505.04627 (p. 261).

A. Carpentier et al. (2011). "Upper-confidence-bound algorithms for active learning in multi-armed bandits". In: *International Conference on Algorithmic Learning Theory*. Springer, pp. 189–203 (p. 264).

D.C. Carslaw (2015). *The openair manual - open-source tools for analysing air pollution data. Manual for version 1.1-4*. King's College London (p. 190).

D.C. Carslaw and K. Ropkins (2012). "Openair - an R package for air quality data analysis". In: *Environmental Modelling & Software* 27-18, pp. 52–61 (p. 190).

C.M. Carvalho, N.G. Polson and J.G. Scott (2010). "The horseshoe estimator for sparse signals". In: *Biometrika* 97.2, pp. 465–480 (pp. 186, 187).

N. Cesa-Bianchi and G. Lugosi (2006). *Prediction, Learning and Games*. Cambridge, UK: Cambridge University Press (pp. 46, 183).

A. Chernov and V.G. Vovk (2009). "Prediction with expert evaluators' advice". In: *Proceedings ALT 2009*. Ed. by R. Gavaldà et al. Springer, pp. 8–22 (p. 46).

C.S. Chihara (1987). "Some Problems for Bayesian Confirmation Theory". In: *British Journal for the Philosophy of Science* 38.4, pp. 551–560 (p. 20).

J.B. Conway (2013). *A course in functional analysis*. Vol. 96. Springer Science & Business Media (p. 115).

T.M. Cover and J.A. Thomas (1991). *Elements of Information Theory*. First. New York: Wiley (pp. 133, 134, 136, 137, 154, 165, 171).

G. Cumming (2012). *Understanding the New Statistics: Effect Sizes, Confidence and Meta-Analysis*. Routledge (p. 158).

W. van Dam, R.D. Gill and P.D. Grunwald (2005). "The statistical strength of nonlocality proofs". In: *IEEE transactions on information theory* 51.8, pp. 2812–2835 (p. 152).

D.A. Darling and H. Robbins (1967). "Confidence sequences for mean, variance, and median". In: *Proceedings of the National Academy of Sciences of the United States of America* 58.1, p. 66 (pp. 152, 262).

S.C. Dass (1998). "Unified Bayesian and conditional frequentist testing procedures". PhD thesis. University of Michigan (p. 107).

S.C. Dass and J.O. Berger (2003). "Unified conditional frequentist and Bayesian testing of composite hypotheses". In: *Scandinavian Journal of Statistics* 30.1, pp. 193–210 (pp. 68, 70, 91, 99, 107, 143).

A.P. Dawid (1982). "The Well-Calibrated Bayesian". In: *Journal of the American Statistical Association* 77.379, pp. 605–611 (pp. 20, 272).

A.P. Dawid (1985). "The Impossibility of Inductive Inference. Comment on Oakes (1985)". In: *Journal of the American Statistical Association* 80.390, pp. 340–341 (p. 19).

A.P. Dawid (1997). "Prequential Analysis". In: *Encyclopedia of Statistical Sciences*. Ed. by S. Kotz, C.B. Read and D. Banks. Vol. 1 (Update). New York: Wiley-Interscience, pp. 464–470 (p. 154).

A.P. Dawid, M. Stone and J.V. Zidek (1973). "Marginalization paradoxes in Bayesian and structural inference". In: *Journal of the Royal Statistical Society: Series B (Methodological)* 35.2, pp. 189–213 (pp. 91, 113).

A.P. Dawid and V.G. Vovk (1999). "Prequential Probability: Principles and Properties". In: *Bernoulli* 5.1, pp. 125–162 (p. 6).

A.P. Dempster (1975). *A Subjective Look at Robustness*. Tech. rep. Research Report S-33. Harvard University (p. 79).

A. Deng, J. Lu and S. Chen (2016). "Continuous monitoring of A/B tests without pain: Optional stopping in Bayesian testing". In: *Data Science and Advanced Analytics (DSAA), 2016 IEEE International Conference on*. IEEE, pp. 243–252 (pp. 60, 64, 95).

J.L. Doob (1971). "What is a Martingale?" In: *The American Mathematical Monthly* 78.5, pp. 451–463 (p. 81).
S. Duane et al. (1987). "Hybrid monte carlo". In: *Physics letters B* 195.2, pp. 216–222 (p. 263).
J. Earman (1992). *Bayes or Bust?* Cambridge, MA: MIT Press (pp. 7, 19, 20, 25, 31, 35).
K. Easwaran (2011). "Bayesianism I: Introduction and arguments in favor". In: *Philosophy Compass* 6.5, pp. 312–320 (pp. 4, 6).
M.L. Eaton (1989). *Group Invariance Applications in Statistics*. Institute of Mathematical Statistics and American Statistical Association (pp. 68, 91, 105, 107, 108, 114, 115, 142).
W. Edwards, H. Lindman and L.J. Savage (1963). "Bayesian Statistical Inference for Psychological Research". In: *Psychological Review* 70.3, pp. 193–242 (pp. 12, 60, 78, 80, 90, 93, 96, 97).
C. Elliot (2014). "Countable additivity in the philosophical foundations of probability". MA thesis (p. 6).
T. van Erven, P.D. Grünwald and S. de Rooij (2007). "Catching up Faster in Bayesian Model Selection and Model Averaging". In: *Advances in Neural Information Processing Systems*. Vol. 20 (p. 177).
T. van Erven and P. Harremoës (2014). "Rényi Divergence and Kullback-Leibler Divergence". In: *IEEE Transactions on Information Theory* 60.7, pp. 3797–3820 (p. 123).
T. van Erven et al. (2015). "Fast Rates in Statistical and Online Learning". In: *Journal of Machine Learning Research* 16, pp. 1793–1861 (pp. 182, 183, 185, 195).
E. Even-dar, S. Mannor and Y. Mansour (2003). "Action elimination and stopping conditions for reinforcement learning". In: *Proceedings of the 20th International Conference on Machine Learning (ICML)* (pp. 16, 206).
B. de Finetti (1937). "La prévision: ses lois logiques, ses sources subjectives". In: *Annales de l'Institut Henri Poincaré* 7, pp. 1–68 (pp. 5, 6, 68).
B. de Finetti (1974). *Theory of probability: a critical introductory treatment*. John Wiley & Sons (p. 4).
R.A. Fisher (1934). "Statistical methods for research workers". In: (p. 11).
R.A. Fisher (1955). "Statistical methods and scientific induction". In: *Journal of the Royal Statistical Society: Series B (Methodological)* 17.1, pp. 69–78 (p. 11).
R.A. Fisher (1956). "Statistical methods and scientific inference". In: (p. 11).
D.A. Freedman (2003). "Notes on the Dutch Book Argument". In: *Lecture Notes, Department of Statistics, University of Berkley at Berkley, http://www. stat. berkeley. edu/˜ census/dutchdef. pdf* (p. 6).
Y. Freund et al. (1997). "Using and combining predictors that specialize". In: *Proceedings STOC 1997*. New York: ACM Press, pp. 334–343 (p. 46).
V. Gabillon, M. Ghavamzadeh and A. Lazaric (2012). "Best arm identification: A unified approach to fixed budget and fixed confidence". In: *Advances in Neural Information Processing Systems 25 (NIPS)* (pp. 206, 218).
P. Gács (2005). "Uniform test of algorithmic randomness over a general space". In: *Theoretical Computer Science* 341.1-3, pp. 91–137 (p. 152).
H. Gaifman and M. Snir (1982). "Probabilities Over Rich Languages, Testing and Randomness". In: *Journal of Symbolic Logic* 47.3, pp. 495–548 (p. 31).
A. Garivier and E. Kaufmann (2016). "Optimal best arm identification with fixed confidence". In: *Proceedings of the 29th Conference on Learning Theory (CoLT)*. arXiv: 1602.04589 (pp. 16, 206, 210, 212, 218, 264).
A.E. Gelfand and A.F.M. Smith (1990). "Sampling-based approaches to calculating marginal densities". In: *Journal of the American statistical association* 85.410, pp. 398–409 (p. 3).
A. Gelman (2008). "Objections to Bayesian statistics". In: *Bayesian Analysis* 3.3, pp. 445–449 (p. 7).
A. Gelman (2017). *Statistical Modeling, Causal Inference, and Social Science* (p. 69).
A. Gelman and C. Shalizi (2012). "Philosophy and the practice of Bayesian statistics". In: *British Journal of Mathematical and Statistical Psychology* (p. 6).
A. Gelman and C.R. Shalizi (2013). "Philosophy and the Practice of Bayesian Statistics". In: *British Journal of Mathematical and Statistical Psychology* 66, pp. 8–38 (p. 20).
A. Gelman et al. (2003). *Bayesian Data Analysis*. Boca Raton, FL: CRC Press (p. 4).

J.K. Ghosh, M. Delampady and T. Samanta (2007). *An introduction to Bayesian analysis: theory and methods*. Springer Science & Business Media (pp. 2, 4).

G. Gigerenzer (1993). "The superego, the ego, and the id in statistical reasoning". In: *A handbook for data analysis in the behavioral sciences: Methodological issues*, pp. 311–339 (p. 12).

G. Gigerenzer and J.N. Marewski (Jan. 2014). "Surrogate Science: The Idol of a Universal Method for Scientific Inference". In: *Journal of Management* 41, pp. 421–440 (pp. 11, 12, 59, 262).

G. Gigerenzer et al. (1990). *The empire of chance: How probability changed science and everyday life*. Vol. 12. Cambridge University Press (p. 12).

D.A. Gillies (2001). "Bayesianism and the Fixity of the Theoretical Framework". In: *Foundations of Bayesianism*. Ed. by D. Corfield and J. Williamson. Springer, pp. 363–379 (p. 20).

C. Glymour (1981). "Why I am not a Bayesian". In: *Theory and evidence*, pp. 63–93 (p. 7).

C. Glymour (2016). "Responses to contributions to special issue". In: *Synthese* 193.4, pp. 1251–1285 (p. 27).

I.J. Good (1971). "46656 varieties of Bayesians". In: *American Statistician* 25.5, p. 62 (p. 3).

I.J. Good (1991). "C383. A comment concerning optional stopping". In: *Journal of Statistical Computation and Simulation* 39.3, pp. 191–192 (pp. 60, 78, 80, 81, 96, 97).

P. Grünwald and T. Roos (2020). "Minimum Description Length Revisited". In: *International Journal of Mathematics for Industry* 11.1 (p. 154).

P.D. Grünwald (2000). "Maximum Entropy and the Glasses You are Looking Through". In: *Proceedings of the Sixteenth Conference on Uncertainty in Artificial Intelligence (UAI 2000)*. San Francisco: Morgan Kaufmann, pp. 238–246 (p. 157).

P.D. Grünwald (2007). *The Minimum Description Length Principle*. MIT Press (pp. 5, 77, 92, 112, 154, 184, 186, 193).

P.D. Grünwald (2012). "The Safe Bayesian: learning the learning rate via the mixability gap". In: *Proceedings 23rd International Conference on Algorithmic Learning Theory (ALT '12)*. Springer (pp. 180, 191, 263).

P.D. Grünwald (2013). "Safe Probability: restricted conditioning and extended marginalization". In: *Proceedings Twelfth European Conference on Symbolic and Quantitative Approaches to Reasoning with Uncertainty (ECSQARU 2013)*. Vol. 7958. Lecture Notes in Computer Science. Springer, pp. 242–252 (p. 82).

P.D. Grünwald (2016). "Toetsen als gokken: een redelijk alternatief voor de p-waarde". In: *Nieuw Archief voor Wiskunde* 5/17.4, pp. 236–244 (p. 12).

P.D. Grünwald (2018). "Safe Probability". In: *Journal of Statistical Planning and Inference* 195. See also arXiv preprint 1604.01785, pp. 47–63 (pp. 61, 82, 157).

P.D. Grünwald and A.P. Dawid (2004). "Game theory, maximum entropy, minimum discrepancy, and robust Bayesian decision theory". In: *Annals of Statistics* 32.4, pp. 1367–1433 (pp. 124, 133, 166, 167).

P.D. Grünwald and J.Y. Halpern (July 2004). "When ignorance is bliss". In: *Proceedings of the Twentieth Annual Conference on Uncertainty in Artificial Intelligence (UAI 2004)*. Banff, Canada (p. 189).

P.D. Grünwald, R. de Heide and W.M. Koolen (2019). *Safe Testing*. arXiv preprint arXiv:1906.07801 (pp. 17, 83, 90, 99).

P.D. Grünwald and J. Langford (2007). "Suboptimal behavior of Bayes and MDL in classification under misspecification". In: *Machine Learning* 66.2-3, pp. 119–149 (pp. 177, 180).

P.D. Grünwald and N.A. Mehta (2019). "Fast Rates for General Unbounded Loss Functions: from ERM to Generalized Bayes". In: *Journal of Machine Learning Research*. Accepted pending minor revision (pp. 15, 157, 164, 178).

P.D. Grünwald and T. van Ommen (2017). "Inconsistency of Bayesian inference for misspecified linear models, and a proposal for repairing it". In: *Bayesian Analysis* 12.4, pp. 1069–1103 (pp. 15, 177, 178, 180, 185, 187, 201, 263).

X. Gu, H. Hoijtink and J. Mulder (2016). "Error probability in default Bayesian hypothesis testing". In: *Journal of Mathematical Psychology* (p. 75).

E. Gunel and J. Dickey (1974). "Bayes factors for independence in contingency tables". In: *Biometrika* 61.3, pp. 545–557 (pp. 84, 85, 148, 157).
I. Hacking (2006). *The Emergence of Probability: A Philosophical Study of Early Ideas About Probability, Induction and Statistical Inference*. 2nd. Cambridge University Press (p. 4).
A. Hájek (2019). "Interpretations of Probability". In: *The Stanford Encyclopedia of Philosophy*. Ed. by Edward N. Zalta. Fall 2019. Metaphysics Research Lab, Stanford University (p. 7).
R. de Heide (2016). *SafeBayes: Generalized and Safe-Bayesian Ridge and Lasso Regression*. R package version 1.1 (p. 187).
R. de Heide and P.D. Grünwald (2018). "Why optional stopping is a problem for Bayesians". In: *arXiv preprint arXiv:1708.08278* (pp. 17, 90, 94–96).
R. de Heide et al. (2020). "Safe-Bayesian Generalized Linear Regression". In: *International Conference on Artificial Intelligence and Statistics*. PMLR, pp. 2623–2633 (p. 17).
A.A. Hendriksen (2017). "Betting as an alternative to *p*-values". MA thesis. Leiden University, Dept. of Mathematics (pp. 68, 111).
A.A. Hendriksen, R. de Heide and P.D. Grünwald (2020). "Optional Stopping with Bayes Factors: a categorization and extension of folklore results, with an application to invariant situations". In: *Bayesian Analysis* (pp. 17, 60, 64, 68, 70, 81, 83, 143, 156, 157).
M.D. Hoffman and A. Gelman (2014). "The No-U-Turn sampler: adaptively setting path lengths in Hamiltonian Monte Carlo." In: *Journal of Machine Learning Research* 15.1, pp. 1593–1623 (p. 263).
C. Holmes and S. Walker (2017). "Assigning a value to a power likelihood in a general Bayesian model". In: *Biometrika* 104.2, pp. 497–503 (p. 177).
S.R. Howard et al. (2018a). "Exponential line-crossing inequalities". In: *arXiv preprint arXiv:1808.03204* (pp. 120, 131, 152, 158).
S.R. Howard et al. (2018b). "Uniform, nonparametric, non-asymptotic confidence sequences". In: *arXiv preprint arXiv:1810.08240* (pp. 99, 120, 131, 152, 158, 262).
C. Howson (1988). "On the Consistency of Jeffreys's Simplicity Postulate, and its Role in Bayesian Inference". In: *The Philosophical Quarterly* 38.150, pp. 68–83 (pp. 20, 27).
C. Howson (2000). *Hume's Problem*. New York: Oxford University Press (p. 19).
C. Howson and P. Urbach (2006). *Scientific reasoning: the Bayesian approach*. Open Court Publishing (p. 4).
Y. Hu (2020). "Safe Wilcoxon test (working title, thesis in preparation)". MA thesis. Leiden University, Mathematical Institute (p. 154).
R. Hubbard (2004). "Alphabet Soup: Blurring the Distinctions Between p's and a's in Psychological Research". In: *Theory & Psychology* 14.3, pp. 295–327 (pp. 11, 12).
C.J. Huberty (1993). "Historical origins of statistical testing practices: The treatment of Fisher versus Neyman-Pearson views in textbooks". In: *The Journal of Experimental Education* 61.4, pp. 317–333 (p. 12).
S.M. Huttegger (2015). "Merging of Opinions and Probability Kinematics". In: *The Review of Symbolic Logic* 8.4, pp. 611–648 (pp. 9, 19).
K. Jamieson et al. (2014). "lil'UCB: An optimal exploration algorithm for multi-armed bandits". In: *Proceedings of the 27th Conference on Learning Theory (CoLT)* (p. 206).
T. Jamil et al. (2016). "Default "Gunel and Dickey" Bayes factors for contingency tables". In: *Behavior Research Methods*, pp. 1–15 (pp. 13, 59, 69, 78, 83, 84, 88, 90, 96, 148, 157).
E.T. Jaynes (1957). "Information Theory and Statistical Mechanics". In: *Physical Review* 108.2, pp. 171–190 (p. 5).
R.C. Jeffrey (1965). *The logic of decision*. University of Chicago Press (pp. 5, 6).
R.C. Jeffrey (1992). *Probability and the Art of Judgment*. Cambridge University Press (p. 4).
H. Jeffreys (1939). *Theory of probability*. 1st (p. 5).

H. Jeffreys (1946). “An invariant form for the prior probability in estimation problems”. In: *Proceedings of the Royal Society of London. Series A. Mathematical and Physical Sciences* 186.1007, pp. 453–461 (p. 5).
H. Jeffreys (1948). *Theory of probability*. 2nd (p. 5).
H. Jeffreys (1961). *Theory of Probability*. Oxford, England: Oxford (pp. 4, 12, 20, 62, 69, 70, 90, 98, 141).
R. Johari, L. Pekelis and D.J. Walsh (2015). “Always valid inference: Bringing sequential analysis to A/B testing”. In: *arXiv preprint arXiv:1512.04922* (pp. 120, 152, 262).
L.K. John, G. Loewenstein and D. Prelec (2012a). “Measuring the Prevalence of Questionable Research Practices With Incentives for Truth Telling”. In: *Psychological science* (p. 89).
L.K. John, G. Loewenstein and D. Prelec (2012b). “Measuring the prevalence of questionable research practices with incentives for truth telling”. In: *Psychological science* 23.5, pp. 524–532 (p. 82).
V.E. Johnson (2013a). “Revised standards for statistical evidence”. In: *Proceedings of the National Academy of Sciences* 110.48, pp. 19313–19317 (p. 126).
V.E. Johnson (2013b). “Uniformly most powerful Bayesian tests”. In: *Annals of statistics* 41.4, p. 1716 (pp. 124, 126, 138, 139).
M. Jordan (2010). *Lecture notes for Stat260 class on Bayesian Modeling and Inference*. retrieved from `http://www.cs.berkeley.edu/ jordan/courses/260-spring10/lectures/lecture10.pdf` (p. 78).
K-S. Jun and R. Nowak (2016). “Anytime exploration for multi-armed bandits using confidence information”. In: *Proceedings of the 33rd International Conference on Machine Learning (ICML)* (pp. 16, 206, 264).
J.B. Kadane, M.J. Schervish and T. Seidenfeld (1999). “Statistical implications of finitely additive probability”. In: *Rethinking the Foundations of Statistics*, p. 211 (p. 6).
E. Kalai and E. Lehrer (1993). “Rational Learning Leads to Nash Equilibrium”. In: *Econometrica* 61.5, pp. 1019–1045 (pp. 10, 30).
E. Kalai and E. Lehrer (1994). “Weak and strong merging of opinions”. In: *Journal of Mathematical Economics* 23.1, pp. 73–86 (p. 30).
S. Kalyanakrishnan et al. (2012). “PAC subset selection in stochastic multi-armed bandits”. In: *Proceedings of the 29th International Conference on Machine Learning (ICML)* (p. 206).
Z. Karnin, T. Koren and O. Somekh (2013). “Almost optimal exploration in multi-armed bandits”. In: *Proceedings of the 30th International Conference on Machine Learning (ICML)* (p. 206).
R.E. Kass and A.E. Raftery (1995). “Bayes Factors”. In: *Journal of the American Statistical Association* 90.430, pp. 773–795 (pp. 12, 62).
E. Kaufmann and A. Garivier (2017). “Learning the distribution with largest mean: two bandit frameworks”. In: *ESAIM: Proceedings and Surveys* 60, pp. 114–131 (p. 206).
E. Kaufmann and W. Koolen (2018). “Mixture martingales revisited with applications to sequential tests and confidence intervals”. In: *arXiv preprint arXiv:1811.11419* (pp. 213, 215).
E. Kaufmann, W.M. Koolen and A. Garivier (2018). “Sequential test for the lowest mean: From Thompson to Murphy sampling”. In: *Advances in Neural Information Processing Systems*, pp. 6332–6342 (p. 264).
J.L. Kelly (1956). “A New Interpretation of Information Rate”. In: *Bell System Technical Journal*, pp. 917–926 (p. 121).
J. Kiefer (1977). “Conditional Confidence Statements and Confidence Estimators”. In: *Journal of the American Statistical Association* 72.360, pp. 789–808 (pp. 153, 157).
A.N. Kolmogorov (1933). *Grundbegriffe der Wahrscheinlichkeitsrechnung*. Berlin: Springer (p. 4).
W.M. Koolen, D. Adamskiy and M.K. Warmuth (2012). “Putting Bayes to Sleep”. In: *Proceedings of the 25th International Conference on Neural Information Processing Systems, NIPS 2012*. Ed. by Fernando Pereira et al., pp. 135–143 (p. 46).
T.L. Lai (1976). “On confidence sequences”. In: *The Annals of Statistics* 4.2, pp. 265–280 (pp. 99, 152, 158).

T.L. Lai (1984). "Incorporating scientific, ethical and economic considerations into the design of clinical trials in the pharmaceutical industry: A sequential approach". In: *Communications in Statistics-Theory and Methods* 13.19, pp. 2355–2368 (p. 262).

T.L. Lai (2009). "Martingales in Sequential Analysis and Time Series, 1945–1985". In: *Electronic Journal for History of Probability and Statistics* 5.1 (p. 152).

P.-S. Laplace (1814). "Essai philosophique sur les probabilités. 2e éd". In: *Paris: Mme Ve Courcier* (p. 3).

E. Lehrer and R. Smorodinsky (1996). "Merging and learning". In: *Statistics, Probability and Game Theory: Papers in Honor of David Blackwell*. Ed. by Thomas S. Ferguson, Lloyd S. Shapley and James B. MacQueen. Vol. 30. Lecture Notes - Monograph Series. Institute of Mathematical Statistics, pp. 147–168 (pp. 10, 31).

J. Leike (2016). "Nonparametric General Reinforcement Learning". PhD Dissertation. Australian National University (pp. 10, 31).

I. Levi (1980). *THe Enterprise of Knowledge: An Essay on Knowledge, Credal Probability, and Chance*. Cambridge, MA: MIT Press (p. 19).

L.A. Levin (1976). "Uniform tests of randomness". In: *Soviet Mathematics Doklady* 17.2, pp. 337–340 (pp. 120, 152).

J.Q. Li (1999). "Estimation of Mixture Models". PhD thesis. New Haven, CT: Yale University (pp. 122, 135, 136, 164, 183).

L. Li et al. (2017). "Hyperband: Bandit-based configuration evaluation for hyperparameter optimization". In: *Proceedings of the 5th International Conference on Learning Representations (ICLR)* (p. 219).

F. Liang et al. (2008). "Mixtures of g Priors for Bayesian Variable Selection". In: *Journal of the American Statistical Association* 103.481, pp. 410–423 (pp. 70, 75, 76, 112, 143).

D.V. Lindley (1957). "A statistical paradox". In: *Biometrika* 44.1/2, pp. 187–192 (pp. 60, 78–80, 90, 93).

D.V. Lindley (1982). "Comment on Dawid (1982)". In: *Journal of the American Statistical Association* 77.379, pp. 611–612 (p. 27).

D.V. Lindley (2000). "The Philosophy of Statistics". In: *Journal of the Royal Statistical Society* 49.3, pp. 293–337 (pp. 21, 27).

A. Ly, A.J. Verhagen and E-J. Wagenmakers (2016). "Harold Jeffreys' default Bayes factor hypothesis tests: Explanation, extension, and application in psychology". In: *Journal of Mathematical Psychology*, pp. 19–32 (pp. 13, 73).

R. Martin, R. Mess and S.G. Walker (2017). "Empirical Bayes posterior concentration in sparse high-dimensional linear models". In: *Bernoulli* 23.3, pp. 1822–1847 (p. 183).

D. McAllester (1998). "Some PAC-Bayesian Theorems". In: *Proceedings of the Eleventh ACM Conference on Computational Learning Theory (COLT' 98)*. ACM Press, pp. 230–234 (p. 157).

P. McCullagh and J. Nelder (1989). *Generalized Linear Models*. Second. Boca Raton: Chapman and Hall/CRC (p. 185).

B.B. McShane et al. (2019). "Abandon Statistical Significance". In: *The American Statistician* 73.sup1, pp. 235–245 (pp. 158, 262).

P. Ménard (2019). "Gradient ascent for active exploration in bandit problems". In: *arXiv preprint arXiv:1905.08165*. arXiv: 1905.08165 (p. 219).

R. von Mises (1939). *Probability, statistics and truth*. Macmillan (p. 7).

R.D. Morey and J.N. Rouder (2015). *BayesFactor: Computation of Bayes Factors for Common Designs*. R package version 0.9.12-2 (pp. 75, 83).

J. Mourtada and O-A. Maillard (2017). "Efficient tracking of a growing number of experts". In: *Proceedings ALT 2017*. Ed. by S. Hanneke and L. Reyzin. Vol. 76. Proceedings of Machine Learning Research. PMLR, pp. 517–539 (p. 46).

U.K. Müller (2013). "Risk of Bayesian inference in misspecified models, and the sandwich covariance matrix". In: *Econometrica* 81.5, pp. 1805–1849 (p. 177).

R. Narasimhan (June 2014). *Package weatherData, get Weather Data from the Web.* URL: http://ram-n.github.io/weatherData/ (p. 202).

J. Neyman and E.S. Pearson (1933). "IX. On the problem of the most efficient tests of statistical hypotheses". In: *Philosophical Transactions of the Royal Society of London. Series A, Containing Papers of a Mathematical or Physical Character* 231.694-706, pp. 289–337 (p. 12).

D. Oakes (1985). "Self-Calibrating Priors Do Not Exist". In: *Journal of the American Statistical Association* 80.390, p. 339 (p. 267).

L. Pace and A. Salvan (2019). "Likelihood, Replicability and Robbins' Confidence Sequences". In: *International Statistical Review* (p. 152).

T. Park and G. Casella (2008). "The Bayesian Lasso". In: *Journal of the American Statistical Association* 103, pp. 369–412 (pp. 180, 187, 197, 199).

S. van der Pas and P.D. Grünwald (2018). "Almost the Best of Three Worlds: Risk, Consistency and Optional Stopping for the Switch Criterion in Nested Model Selection". In: *Statistica Sinica* 1.18. see also arXiv preprint 1408.5724, pp. 229–255 (pp. 81, 92, 112).

S. van der Pas et al. (2016). "horseshoe: Implementation of the Horseshoe Prior". In: *R package version 0.1.0* (p. 187).

N.G. Polson, J.G. Scott and J. Windle (2013). "Bayesian inference for logistic models using Pólya–Gamma latent variables". In: *Journal of the American statistical Association* 108.504, pp. 1339–1349 (pp. 187, 188, 199, 200).

L. Pomatto, P. Strack and O. Tamuz (2020). "Stochastic dominance under independent noise". In: *Journal of Political Economy* 128.5 (p. 168).

E. Posner (1975). "Random coding strategies for minimum entropy". In: *IEEE Transactions on Information Theory* 21.4, pp. 388–391 (pp. 144, 175).

M.A. Proschan, K.K.G. Lan and J.T. Wittes (2006). *Statistical monitoring of clinical trials: a unified approach*. Springer Science & Business Media (p. 96).

H. Putnam (1963). "'Degree of Confirmation' and Inductive Logic". In: *The Philosophy of Rudolf Carnap*. Ed. by Paul A. Schilpp. LaSalle, IL: Open Court, pp. 761–783 (pp. 19, 20).

C. Qin, D. Klabjan and D. Russo (2017). "Improving the expected improvement algorithm". In: *Advances in Neural Information Processing Systems 30 (NIPS)*. arXiv: 1705.10033 (pp. 207, 210, 212–215, 222, 226, 227, 242, 244, 246, 248).

Eric Raidl (2020). "Open-Minded Orthodox Bayesianism by Epsilon-Conditionalization". In: *British Journal for the Philosophy of Science* 71.1, pp. 139–176 (p. 21).

H. Raiffa and R. Schlaifer (1961). *Applied Statistical Decision Theory*. Cambridge, MA: Harvard University Press (pp. 90, 94).

F.P. Ramsey (1926). "Truth and probability. Reprinted in". In: *Studies in subjective probability*, pp. 61–92 (pp. 4, 6).

J. Rissanen (1989). *Stochastic Complexity in Statistical Inquiry*. Hackensack, N.J.: World Scientific (p. 154).

H. Robbins (1970). "Statistical methods related to the law of the iterated logarithm". In: *The Annals of Mathematical Statistics* 41.5, pp. 1397–1409 (pp. 143, 152, 262).

H. Robbins and D. Siegmund (1972). "A class of stopping rules for testing parametric hypotheses". In: *Proceedings of the Sixth Berkeley Symposium on Mathematical Statistics and Probability (Univ. California, Berkeley, CA, 1970/1971)*. Vol. 4, pp. 37–41 (p. 262).

H. Robbins and D. Siegmund (1974). "The expected sample size of some tests of power one". In: *The Annals of Statistics*, pp. 415–436 (p. 262).

C.P. Robert (2007). *The Bayesian choice: from decision-theoretic foundations to computational implementation*. Springer Science & Business Media (p. 6).

J-W. Romeijn (2004). "Hypotheses and Inductive Predictions". In: *Synthese* 141.3, pp. 333–364 (pp. 19, 46).

J-W. Romeijn (2005a). "Bayesian inductive logic". PhD Dissertation. University of Groningen (p. 4).

J-W. Romeijn (2005b). "Theory Change and Bayesian Statistical Inference". In: *Philosophy of Science* 72.5, pp. 1174–1186 (p. 20).
J-W. Romeijn (2017). "Philosophy of Statistics". In: *The Stanford Encyclopedia of Philosophy*. Ed. by Edward N. Zalta. Spring 2017. Metaphysics Research Lab, Stanford University (p. 6).
J.N. Rouder (2014). "Optional stopping: No problem for Bayesians". In: *Psychonomic Bulletin & Review* 21.2, pp. 301–308 (pp. 13, 59–63, 65, 82, 83, 90, 94, 97).
J.N. Rouder (2019). "On The Interpretation of Bayes Factors: A Reply to de Heide and Grunwald". In: (p. 262).
J.N. Rouder and J.M. Haaf (n.d.). "Optional Stopping and the Interpretation of The Bayes Factor". In: () (p. 262).
J.N. Rouder and R.D. Morey (2012). "Default Bayes Factors for Model Selection in Regression". In: *Multivariate Behavioral Research* 47.6, pp. 877–903 (pp. 75, 83).
J.N. Rouder et al. (2009). "Bayesian t tests for accepting and rejecting the null hypothesis". In: *Psychonomic Bulletin & Review* 16.2, pp. 225–237 (pp. 13, 59, 66, 69–71, 83, 90, 97, 98, 108, 112, 141).
J.N. Rouder et al. (2012). "Default Bayes factors for ANOVA designs". In: *Journal of Mathematical Psychology* 56.5, pp. 356–374 (pp. 59, 69, 79, 83, 90, 112).
R. Royall (1997). *Statistical evidence: a likelihood paradigm*. Chapman and Hall (pp. 122, 147).
D. Russo (2016). "Simple Bayesian algorithms for best arm identification". In: *Proceedings of the 29th Conference on Learning Theory (CoLT)*. arXiv: 1602.08448 (pp. 16, 205–207, 210–212, 218, 219, 222, 247, 249, 256, 257).
B.Y. Ryabko and V.A. Monarev (2005). "Using information theory approach to randomness testing". In: *Journal of Statistical Planning and Inference* 133.1, pp. 95–110 (p. 154).
A.N. Sanborn and T.T. Hills (2014). "The frequentist implications of optional stopping on Bayesian hypothesis tests". In: *Psychonomic Bulletin & Review* 21.2, pp. 283–300 (pp. 60, 64, 81, 82, 90).
L.J. Savage (1954). *The Foundations of Statistics*. New York: John Wiley and Sons (pp. 4, 5, 60, 68, 78–80).
F.D. Schönbrodt et al. (2017). "Sequential Hypothesis Testing With Bayes Factors: Efficiently Testing Mean Differences". In: *Psychological Methods* 22.2, pp. 322–339 (pp. 81, 90).
J. ter Schure and P. Grünwald (2019). "Accumulation Bias in meta-analysis: the need to consider time in error control". In: *F1000Research* 8 (p. 120).
T. Seidenfeld (1979). "Why I am not an objective Bayesian; some reflections prompted by Rosenkrantz". In: *Theory and Decision* 11.4, pp. 413–440 (pp. 5, 61).
T. Seidenfeld (2016). *Personal Communication* (p. 147).
T. Seidenfeld and M.J. Schervish (1983). "A conflict between finite additivity and avoiding Dutch book". In: *Philosophy of Science* 50.3, pp. 398–412 (p. 6).
T. Sellke, M.J. Bayarri and J.O. Berger (2001). "Calibration of ρ values for testing precise null hypotheses". In: *The American Statistician* 55.1, pp. 62–71 (p. 153).
G. Shafer (2019). *The Language of Betting as a Strategy for Statistical and Scientific Communication*. working paper, available at `http://probabilityandfinance.com/articles/index.html` (p. 155).
G. Shafer and V. Vovk (2001). *Probability and Finance – It's Only a Game!* New York: Wiley (p. 155).
G. Shafer and V. Vovk (2019). *Game-Theoretic Probability: Theory and Applications to Prediction, Science and Finance*. Wiley (pp. 120, 152, 153, 155, 162, 262).
G. Shafer et al. (Feb. 2011). "Test Martingales, Bayes Factors and p-Values". In: *Statistical Science* 26.1, pp. 84–101 (pp. 92, 120, 152).
S. Shalev-Shwartz and S. Ben-David (2014). *Understanding machine learning: From theory to algorithms*. Cambridge university press (p. 181).
X. Shang, E. Kaufmann and M. Valko (2019). "A simple dynamic bandit algorithm for hyper-parameter tuning". In: *6th Workshop on Automated Machine Learning at International Conference on Machine Learning (ICML-AutoML)* (p. 219).

X. Shang et al. (2020). "Fixed-confidence guarantees for Bayesian best-arm identification". In: *International Conference on Artificial Intelligence and Statistics*. PMLR, pp. 1823–1832 (p. 17).

J. Shawe-Taylor and R.C. Williamson (1997). "A PAC Analysis of a Bayesian classifier". In: *Proceedings of the Tenth ACM Conference on Computational Learning Theory (COLT' 97)*. Nashville, T., pp. 2–9 (p. 157).

A. Shimony (1969). *Letter to Rudolf Carnap, September 20*. Rudolf Carnap Papers, 1905-1970, ASP.1974.01, Series XII. Notes and Correspondence: Probability, Mathematics, Publishers, UCLA Administrative, and Lecture Notes, 1927-1970, Subseries 1: Probability Authors, Box 84b, Folder 55, Special Collections Department, University of Pittsburgh. (p. 20).

A. Shimony (1970). "Scientific inference". In: *The Nature and Function of Scientific Theories*. Ed. by Robert G. Colodny. University of Pittsburgh Press, pp. 79–172 (pp. 20, 24, 27).

J. Sprenger and S. Hartmann (2019). *Bayesian Philosophy of Science*. Oxford University Press (p. 27).

Jan Sprenger (2020). "Conditional Degree of Belief and Bayesian Inference". In: *Philosophy of Science* 87.2, pp. 319–335 (p. 27).

T.F. Sterkenburg (2019). "Putnam's Diagonal Argument and the Impossibility of a Universal Learning Machine". In: *Erkenntnis* 84.3, pp. 633–656 (p. 19).

T.F. Sterkenburg and R. de Heide (2019). "On the truth-convergence of open-minded Bayesianism". In: *tbk* (p. 17).

D. Sun and J.O. Berger (2007). "Objective Bayesian analysis for the multivariate normal model". In: *Bayesian Statistics* 8, pp. 525–562 (p. 143).

N. Syring and R. Martin (2017). "Calibrating general posterior credible regions". In: *arXiv preprint arXiv:1509.00922* (p. 177).

M.S. Talebi and O-A. Maillard (2019). "Learning Multiple Markov Chains via Adaptive Allocation". In: *Advances in Neural Information Processing Systems*, pp. 13322–13332 (p. 264).

J.N. Tendeiro and H.A.L. Kiers (2019). "A review of issues about null hypothesis Bayesian testing." In: *Psychological methods* (p. 60).

W.R. Thompson (1933). "On the likelihood that one unknown probability exceeds another in view of the evidence of two samples". In: *Biometrika* 25.3/4, p. 285 (p. 206).

R. Tibshirani (1996). "Regression shrinkage and selection via the lasso". In: *J. Roy. Statist. Soc. Ser. B* 58.1, pp. 267–288 (p. 187).

F. Topsøe (1979). "Information-Theoretical Optimization Techniques". In: *Kybernetika* 15.1, pp. 8–27 (p. 166).

A.B. Tsybakov (2004). "Optimal aggregation of classifiers in statistical learning". In: *Annals of Statistics* 32, pp. 135–166 (p. 183).

J.W. Tukey (1980). "We need both exploratory and confirmatory". In: *The American Statistician* 34.1, pp. 23–25 (p. 2).

R. Turner (2019). "Safe tests for 2×2 contingency tables and the Cochran-Mantel-Haenszel test". MA thesis. Leiden University, Mathematical Institute (p. 145).

Olav Benjamin Vassend (2019). "New Semantics for Bayesian Inference: The Interpretive Problem and Its Solutions". In: *Philosophy of Science* 86.4, pp. 696–718 (p. 27).

J-A. Ville (1939). *Étude critique de la notion de collectif*. Monographies des probabilités. Paris: Gauthier-Villars (p. 152).

V. Vovk and R. Wang (2019). "Combining e-values and p-values". In: *Available at SSRN* (pp. 120, 152).

V.G. Vovk (1993). "A logic of probability, with application to the foundations of statistics". In: *Journal of the Royal Statistical Society, series B* 55. (with discussion), pp. 317–351 (p. 153).

V. Vovk et al. (2011). "Test Martingales, Bayes Factors and p-Values". In: *Statistical Science* 26.1, pp. 84–101 (p. 81).

E-J. Wagenmakers (2007). "A practical solution to the pervasive problems of p-values". In: *Psychonomic Bulletin & Review* 14.5, pp. 779–804 (pp. 12, 61, 62, 80, 90).

E-J. Wagenmakers et al. (2012). "An Agenda for Purely Confirmatory Research". In: *Perspectives on Psychological Science* 7, pp. 627–633 (p. 59).

E.-J. Wagenmakers, Q.F. Gronau and J. Vandekerckhove (2019). "Five Bayesian Intuitions for the Stopping Rule Principle". In: (p. 262).

A. Wald (1947). "An essentially complete class of admissible decision functions". In: *The Annals of Mathematical Statistics*, pp. 549–555 (p. 6).

S. Walker and N.L. Hjort (2002). "On Bayesian consistency". In: *Journal of the Royal Statistical Society: Series B (Statistical Methodology)* 63.4, pp. 811–821 (pp. 178, 183).

P. Walley (1991). *Statistical Reasoning with Imprecise Probabilities*. Vol. 42. Monographs on Statistics and Applied Probability. London: Chapman and Hall (p. 133).

R.L. Wasserstein, N.A. Lazar et al. (2016). "The ASAs statement on p-values: context, process, and purpose". In: *The American Statistician* 70.2, pp. 129–133 (pp. 12, 120, 156).

S. Wenmackers and J-W. Romeijn (2016). "New theory about old evidence: A framework for open-minded Bayesianism". In: *Synthese* 193.4, pp. 1225–1250 (pp. 10, 20, 24, 26–28, 35, 261).

R.A. Wijsman (1990). *Invariant measures on groups and their use in statistics*. Institute of Mathematical Statistics (pp. 91, 114).

J. Williamson (1999). "Countable additivity and subjective probability". In: *The British Journal for the Philosophy of Science* 50.3, pp. 401–416 (p. 6).

J. Windle, N.G. Polson and J.G. Scott (2014). "Sampling Pólya-gamma random variates: alternate and approximate techniques". In: *arXiv preprint arXiv:1405.0506* (pp. 200, 201).

R.L. Wolpert (1996). "Testing Simple Hypotheses". In: *Data Analysis and Information Systems: Statistical and Conceptual Approaches*. Ed. by H.H. Bock and W. Polasek. Berlin: Springer, pp. 289–297 (p. 153).

K. Yamanishi (1998). "A Decision-Theoretic Extension of Stochastic Complexity and its Applications to Learning". In: *IEEE Transactions on Information Theory* 44.4, pp. 1424–1439 (p. 183).

Y. Yao et al. (2018). "Using Stacking to Average Bayesian Predictive Distributions". In: *Bayesian Analysis*. Advance publication; Number and pages to be announced (p. 177).

E.C. Yu et al. (2014). "When decision heuristics and science collide". In: *Psychonomic Bulletin & Review* 21.2, pp. 268–282 (pp. 60, 64, 90).

A. Zellner and A. Siow (Feb. 1980). "Posterior odds ratios for selected regression hypotheses". In: *Trabajos de Estadistica Y de Investigacion Operativa* 31.1, pp. 585–603 (p. 75).

T. Zhang (2006a). "From ε-entropy to KL-entropy: Analysis of minimum information complexity density estimation". In: *The Annals of Statistics* 34.5, pp. 2180–2210 (pp. 178, 183).

T. Zhang (2006b). "Information-theoretic upper and lower bounds for statistical estimation". In: *IEEE Transactions on Information Theory* 52.4, pp. 1307–1321 (pp. 178, 183, 184).

Y. Zhang (2013). "Analysis of tests of local realism". PhD thesis. Boulder, CO: University of Colorado (p. 152).

Y. Zhang, S. Glancy and E. Knill (2011). "Asymptotically optimal data analysis for rejecting local realism". In: *Physical Review A* 84.6, p. 062118 (pp. 120, 152).

Alphabetical Index

bandit
  Beta-Bernoulli, 208
  Gaussian, 208
  multi-armed, 16
  stochastic, 16, 205
Bayes
  ' rule, 5, 23
  ' theorem, 23, 62
  factor, 12, 62, 101, 122
  generalised, 15, 177, 179
  marginal, 2, 12, 22, 92, 106, 122
  posterior, 2, 14
Bayesian
  β-optimality, 212
  generalised lasso regression, 197
  generalised logistic regression, 199
  lasso regression, 186
  linear regression, 75
  logistic regression, 187
Bayesianism
  forward-looking, 44, 46
  objective, 5
  open-minded, 10, 21
  open-minded, hybrid, 28
  open-minded, silent, 26
  open-minded, vocal, 24
  pragmatic, 6, 68
  subjective, 5, 68
best-arm identification, 16, 205
  fixed budget, 16, 206
  fixed confidence, 16, 206
  recommendation rule, 16, 206
  sampling rule, 16, 206
  stopping rule, 16, 206
Blackwell-Dubins' theorem, 30

calibration, 63, 94, 102
  hypothesis, 94
  prior, 68
  strong, 68, 110
central condition, 178, 182, 183
compactness, 114
compatibility, 100
completed agent measure, 42
conjugate distribution, 3

δ-correct strategy, 211

E-value, 13, 119
E-variable, 13, 119
  non-parametric, 139
excess risk, 195

Frequentism, 7

g-prior, 76
GLM, 14, 179, 185
group, 114
  action, 115
  law, 114
  topological, 115
  transformation, 115
  transitive group action, 107
GROW, 123, 133

Hausdorff (topological space), 114
horseshoe estimator, 187
hypothesis, 1
hypothesis space, 21
hypothesis testing, 11
  Bayes factors, 12, 89, 156
  classical, 11
  Fisherian, 11, 155
  frequentist, 11
  Neyman-Pearsonian, 11, 132, 155
  p-value based NHST, 11
  sequential, 152

induction, 1
information complexity, 182, 184
  GLM, 186
initial sample, 99
invariant, 107
  maximal, 107

Jeffreys' prior, 5, 66
joint information projection (JIPr), 123, 125, 134

Kelly gambling, 121

learning problem, 179
learning rate, 15, 179
linear regression, 14, 179
local compactness, 114
logistic regression, 14, 179
loss, 179
  log-, 15, 179
  mix-, 183
  square, 15, 179

marginalisation paradox, 113
MCMC, 3, 15, 186
merger
  strong, 10, 30
  truth-, 10, 30
  weak, 10, 31
minimal sample, 100
misspecification metric, 181
model evidence, 2
model misspecification, 2, 15, 177

nuisance parameter, 106

optimal action probability, 209
optional continuation, 127
optional stopping, 130
  frequentist, 80, 95, 103, 111
  semi-frequentist, 95
  subjective Bayesian, 78
orbit, 107
outcome space, 21

p-value, 11, 121
posterior, 2, 62
posterior odds, 62
  nominal, 94
  observed, 94
power, 11, 133
prior, 2
  default, 6, 68
  improper, 12, 67
  objective, 5
  pragmatic, 6, 68
  subjective, 5, 68
pure exploration, 205

quotient σ-algebra, 107
quotient space, 107

reverse information projection (RIPr), 122
right-Haar measure, 115
right-Haar prior, 68, 91
risk, 179

safe test, 120
Safe-Bayesian algorithm, 15, 201
significance level, 11, 95
statistical
  hypothesis, 2
  model, 2
statistics
  classical, 7
  frequentist, 7
stopping rule, 92
  Bayesian, 210
  Chernoff, 210
stopping rule principle, 93
stopping time, 99

τ-independence, 92, 102
test martingale, 130, 152
Top-Two Thompson Sampling, 16, 205, 207, 208
Top-Two Transportation Cost, 16, 205, 207, 208
topological space, 114
topology, 114
transportation cost, 211
Type I error, 11
Type II error, 11

uniformly most powerful Bayes test, 126, 157

witness condition, 195