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Mining sensor data from complex systems

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Propositions
for the PhD thesis
Mining Sensor Data from Complex Systems
by Ugo Vespier

1. The advances in sensing technology represent a fundamental improvement in our ability to measure complex systems and obtain better representations of them in data. (Chapter 1 and Chapter 2)
2. A side effect of the exponential explosion of data collection is that labeled information will be an increasingly scarce resource in the future, as it is extremely costly to produce labeled datasets in relation to the current rate of data growth (Chapter 1).
3. When monitoring complex physical systems over time, one often finds multiple phenomena in the data that work on different time scales (Chapter 4).
4. The Minimum Description Length principle, paired with the scale-space construction, represents an effective way of discerning what is fundamental and what is not in a time series, while considering different scales of analysis (Chapter 4 and Chapter 5).
5. The recognition of repeating phenomena in time series is an important task in many applications, as it enables further processing of the data at a more conceptual level (Chapter 5).
6. Although naive subsequence clustering is shown to produce artifacts, a careful design of the employed similarity measure can produce meaningful results (Chapter 6).
7. Interactive visualization is one of the most powerful and immediate ways of analyzing a dataset, relying on the ability of the human brain to abstract, summarize, spot trends and anomalies through visual inspection (Chapter 7).
8. The most amazing things happen when Computer Science is applied and mixed with other disciplines. This should be considered while rethinking the education system.
9. Intelligent behavior can be subjective and dependent on context; this is true for computers as well as for humans.
10. Everything should be made as simple as possible, but not simpler (A. Einstein).
11. The first principle is that you must not fool yourself, and you are the easiest person to fool (R. Feynman).