



Universiteit
Leiden
The Netherlands

Automatic and efficient tomographic reconstruction algorithms

Lagerwerf, M.J.

Citation

Lagerwerf, M. J. (2021, October 5). *Automatic and efficient tomographic reconstruction algorithms*. Retrieved from <https://hdl.handle.net/1887/3214854>

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/1887/3214854>

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

Automatic and Efficient Tomographic Reconstruction Algorithms

Proefschrift

ter verkrijging van
de graad van doctor aan de Universiteit Leiden,
op gezag van rector magnificus prof.dr.ir. H. Bijl,
volgens besluit van het college voor promoties
te verdedigen op dinsdag 5 oktober 2021

klokke 10:00 uur

door

Marinus Jan Lagerwerf
geboren te Wageningen
in 1990

Promotor:

Prof. dr. K. J. Batenburg

Copromotor:

dr. W. J. Palenstijn

*Samenstelling promotiecommissie***Voorzitter:**

Prof. dr. F.A. van der Duijn Schouten

Secretaris:

Prof. dr. S. J. Edixhoven

Overige leden:

Prof. dr. C.B. Schönlieb

Dr. C. Brune

Prof. dr. R.H. Bisseling

University of Cambridge

Universiteit Twente

Universiteit Utrecht



The research presented in this dissertation was carried out at Centrum Wiskunde & Informatica (CWI) in Amsterdam.

Financial support was provided by The Netherlands Organisation for Scientific Research (NWO), project number 639.073.506.

Contents

1	Introduction	3
1.1	Tomographic reconstruction problem	7
1.2	Reconstruction methods	13
1.3	Outline of the thesis	21
2	An interpolation approach for determining regularization parameters	23
2.1	Introduction	23
2.2	Notation and mathematical preliminaries	26
2.3	Method description	29
2.4	Experiments	32
2.5	Results and discussion	36
2.6	Conclusion	47
3	Automated FDK-Filter selection for cone-beam Computed Tomography	51
3.1	Introduction	51
3.2	Method	53
3.3	Experiments	57
3.4	Results and discussion	61
3.5	Conclusions and outlook	71
3.6	Appendices	71
4	Neural Network Feldkamp-Davis-Kress algorithm	77
4.1	Introduction	77
4.2	Related work	79
4.3	Method	80
4.4	Experimental setup	88
4.5	Results and discussion	92
4.6	Summary and conclusion	101
4.7	Appendices	103

5 Noise2Filter: self-supervised learning and real-time reconstruction algorithm	107
5.1 Introduction	107
5.2 Preliminaries	110
5.3 Noise2Filter method	115
5.4 Experimental setup	118
5.5 Experiments & Results	119
5.6 Conclusion and outlook	126
5.7 Appendices	127
6 Conclusion	129
Bibliography	133
List of publications	145
Samenvatting in het Nederlands	147
Curriculum Vitae	155