



75 years of pioneering research at Centrum Wiskunde en informatica



Presentation prof. Dr. A.G. (Ton) de Kok, director of CWI
@ Startup village, 9 december 2021

Acquaintance.

Prof. Dr. A.G. (Ton) de Kok

- Director of CWI
- Professor of Quantitative Analysis of Operational Processes at Eindhoven University of Technology



This presentation:

- 75 years CWI
- Scientific highlights
- Awards
- CWI in the media
- Collaboration / spin off's

**CWI's links to Dutch universities
via joint professorships**



Facts & figures per 1/1/2020:

- Year of foundation: 1946
- Director: Ton de Kok
- Located on Amsterdam Science Park
- Number of employees: 229 (213 fte)
- Number of scientific staff 115 (106 fte), coming from 25 countries
- Number of scientific staff with part-time appointments at universities: 27 professors and 2 associate professors
- Number of PhD-students: 69 (68 fte)
- Number of support staff: 45 (39 fte).



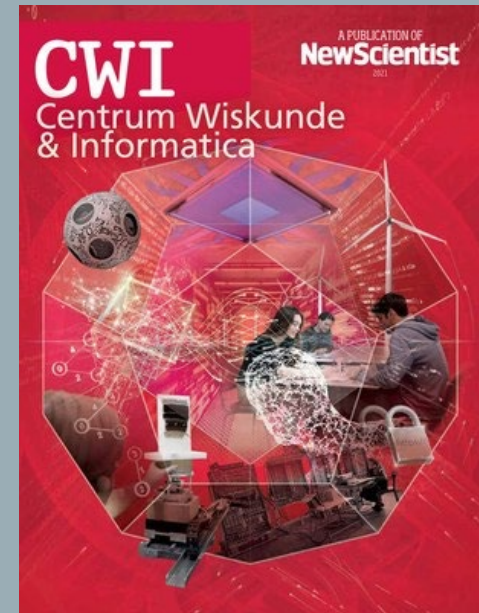
CWI: research themes:

Currently 6 research themes:

- Artificial Intelligence
- Computation
- Cryptography & Security
- Data, Networks
- Software
- Quantum.

We celebrate 75 years:

- Mini documentary/video
- Online event
- New Scientist Jubileummagazine
 - <https://bit.ly/3duEjEx>
- Podcast
- Lectures/Soiree
- <https://www.cwi.nl/news/blogs/cwi-75-years-of->



Sander Bohté: Energy efficient AI.



- Developed new algorithm for spiking neural network.
- More than a thousand times more energy efficient.
- Now possible to put AI in chips so that applications can run locally.

aG CONNECT
the amazing world of IT

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NIEUWS MANAGEMENT BEHEER DEVELOPMENT

Doorzoek website

INNOVATIE & STRATEGIE

WETENSCHAP

Biologie lost energieprobleem AI op

"GPU's zijn niet geoptimaliseerd voor neurale netwerken, dus daar is veel winst te halen."



Spraak-herkenning



Classificatie van ECG signalen



Herkenning van gebaren

Peter Bosman: AI for better cancer radiation.

- New algorithms for more precise irradiation of prostate cancer.
- Partner UMC has been using software based on Bosman's AI since March 2020.
- Recently awarded new funding for follow-up research with LUMC.



Bert Zwart: major power failures explained with new mathematical framework.



- The size of energy disruptions can be linked to the size of cities.
- Insight created by a combination of theories in the field of extreme values and physics.
- Conclusion: networks upgrade in these cases only leads to a moderate reduction in the change of a major blackout.

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City Sizes May Affect Blackout Probabilities

July 31, 2020 • Physics 13, 122

The probabilities of electricity blackouts may be influenced by the sizes of cities more than by the details of power grids.



An avalanche of failure, large-scale blackouts can be triggered by small events, such as the failure of a power line like this one in Missouri in 2007, caused by an ice storm. A new model suggests that the explanation lies in the probabilities of various... flow waves

Electric power blackouts can occur on all scales, from local outages to country-wide failures. The probability of a given event depends on the size of the region it affects, according to a mathematical relationship called a power law. The reason for the power law hasn't been clear, but a new model suggests that it results from the same kind of distribution in the size of cities [3]. The model's creators say that understanding the factors that influence blackout probabilities could help engineers make electricity grids more robust.

Emergence of Scale-Free Blackout Sizes in Power Grids
Tommaso Nelli, Fionn Smeetham, and Bert Zwart
Phys. Rev. Lett. 125, 088301 (2020)
Published July 31, 2020

Recent Articles

An Optical System Defies Conventional Band Theory
Squeezed wave functions reshape an open quantum system's bulk boundary properties and generate a new class of parity-time symmetry.

An Efficient Way to Predict Water's Phases
A machine-learning technique maps water's phase space as reliably as gold standard ab initio calculations but at a much smaller computational cost.

Robo-Fish Replicates Real Swimming Action
A robotic fish whose swimming action is initiated in the same way as that of real fish could help researchers test predictions about these underwater creatures, using well-controlled conditions.

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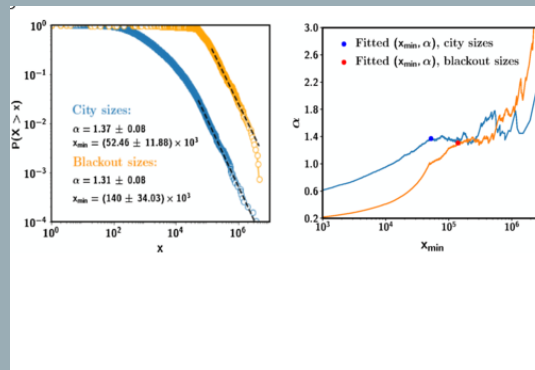
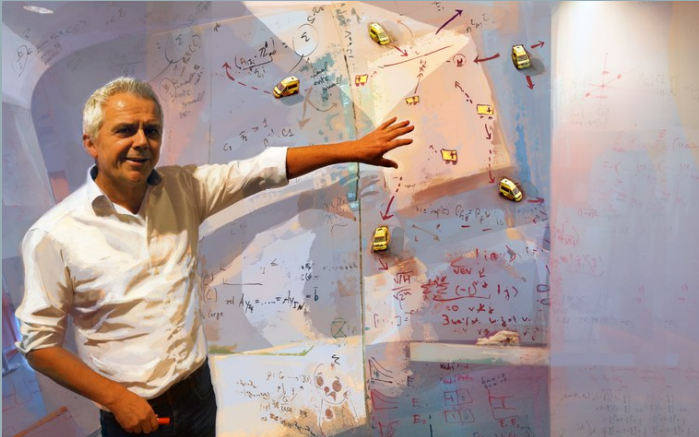


Figure 1
Left: Pareto tail behavior of U.S. city [25] and blackout sizes [50] in the region $x > x_{\min}$. Estimates are based on PLFIT [25]. Points depict the empirical complementary cumulative distribution function (CCDF); solid line depicts the CCDF of a Pareto distribution with parameters α , x_{\min} . Right: Hill estimator $x_{\min} \rightarrow \alpha(x_{\min})$, also known as the Hill plot [35]. The PLFIT estimates for city sizes (blue dot) and blackout sizes (red dot) lie within a relatively flat region of the graph, providing support for the Pareto fit.

Huibregtsen award: saving lives with mathematics.



- Prof. Dr. van der Mei won the Huibregtsen Award together with VU colleague Sandjai Bhulai for developing models that allow ambulances to arrive on time more often in the event of an accident.

From the jury report:

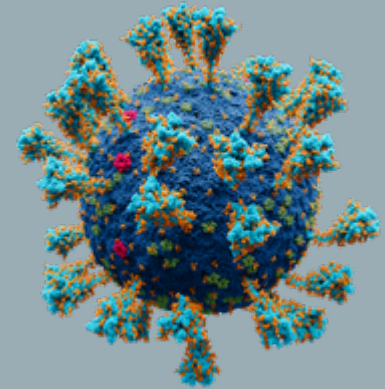
“Van der Mei and Bhulai deserve this recognition because they are able to combine the scientific quality and innovation of their research with a special social value.”



CWI contribution to fight corona.

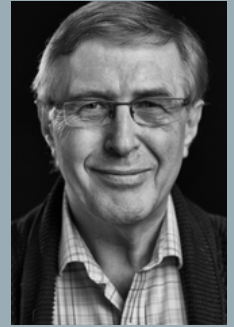
CWI researchers contributed to:

- *Epidemiological models*
- *The CoronaCheck app*
- *Statistical models for drug trials*
- *Contribute to digital support to combat Covid-19.*



Awards 2020 / 2021

- Jos Baeten appointed Knight in the Order of Orange Nassau.
- Martin Kersten appointed Knight in the Order of Orange Nassau.
- Pablo Cesar: ACM Distinguished Member '21, Dutch prize for ICT research '20.
- Tim Baarslag: installed as a member of the Young Academy.



CWI in the Media:




*"Like a good deal?
Maybe a haggelbot
can help"*



#03 WAAROM MOET JE NU ECHT AL REKENING HOUDEN MET DE KWANTUMCOMPUTER?

De kwantumcomputer lijkt nog ver weg. Maar kopieën van alle data die nu versleuteld worden verstuurd, komen ergens in een database terecht. Ook al wil je dat niet. Die informatie ligt straks open en bloot. En er zijn meer redenen om nu al te zorgen dat gegevens straks nog steeds veilig zijn.




TOEKOMST-
MUZIEK

INNOVATIE / PODCAST




ORPAGINA [VERDIEPING](#) OPINIE RELIGIE&FILOSOFIE DUURZAAM

Digitale veiligheid

**Websites van de overheid
zijn vaak makkelijk te
hacken**



**Programma Atlas: Tim Baarslag's
Huizenbodalgoritme**



Spraakmakers

Rob van der Mei
hoogleraar Toegepaste wiskunde

Recent CWI spin-off's.

- **DuckDB Labs**

Data management.

<http://duckdblabs.com/>

- **Photosynthetic**

Hardware solutions for the microfabrication industry.

<https://photosynthetic.nl/>

Stokhos

Logistics & planning for the emergency services.

<http://stokhos.nl/>

Thank you for your attention!

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