

# DAAN VAN VUGT

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## EXPERIENCE

- 2018 - present     **Co-owner at [tracklete.io](https://tracklete.io)**
- An online system for rower performance tracking and crew management
  - Develop the web application, focusing on workout analytics and GPS data
  - Work on strategy for (international) expansion
- 2017 - 2018     **Developer at [chaintip.io](https://chaintip.io)**
- Building a blockchain-backed market for securities
- 2009 - 2016     **Owner at [Daan van Vugt web design & development](#)**
- Building and designing websites and mobile apps

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## EDUCATION

- 2015 - present  
(est. June 2019)     **Ph.D. in Applied Physics**  
*Eindhoven University of Technology · ITER Organization*
- Specialisation in Science and Technology of Nuclear fusion
  - Thesis on "Nonlinear coupled MHD-kinetic particle simulations of heavy impurities in tokamak plasmas"
  - Extended the existing MHD code [JOREK](#) with a kinetic particle transport model, with particle sputtering, reflection, ionisation, recombination, radiation, particle-background collisions and feedback to the MHD fluid.
  - In collaboration with ITER Organization, site of the multi-billion dollar ITER tokamak
  - Used modern Fortran, High-Performance Computing (HPC) techniques
  - 'Big Data' approach for analysis of terabytes of particle trajectories
- 2012 - 2015     **Master of Science (Cum Laude) in [Applied Physics](#)**  
*Eindhoven University of Technology · ASML*
- Specialisation in fluid dynamics
  - Thesis on "Droplet Collisions for target shaping in EUV Sources" at ASML Research (grade: 9)
- 2012 - 2013     **Certificate Technical Management**  
*Eindhoven University of Technology*
- 2009 - 2012     **Bachelor of Science in [Applied Physics](#)**  
*Eindhoven University of Technology*

- Thesis on “Ultrafast, non-linear photoemission from a copper cathode” (grade: 9)

2003 - 2009

## **Gymnasium in track ‘Nature and Technology’**

*Titus Brandsma Lyceum, Oss*

- Extra subjects: Latin, Management & Organisation, Biology.

## **TEACHING EXPERIENCE**

2018

### **Masterclass on computational magnetohydrodynamics**

- Finite difference, finite element methods, refinement
- Matrix solutions, sparse matrices, preconditioning
- Time-evolution, Neumann stability analysis, Newton-Krylov method
- Navier-Stokes, MagnetoHydroDynamics (MHD)
- Visualisation, HPC, parallelisation, verification & validation
- 50 hours in 5 days
- 12 hours of lectures, rest hands-on experimentation in Fortran

2016 & 2017

### **Co-lecturer masterclass on computational magnetohydrodynamics**

- Lectures on computational best practices, Unix, Fortran, Git, HPC, MPI & OpenMP
- With prof. dr. ir. G.T.A. Huijsmans

2015 - 2019

### **Student supervision**

- Master thesis on kinetic modelling of neutral deuterium in tokamaks
- Master thesis on fluid modelling of neutral deuterium in tokamaks
- Master thesis on impurity-dependence of the tokamak density limit
- Master internships on low-discrepancy sequences, physical sputtering

## **PROJECTS**

2018 - Current

### **Kraemer** *High-frequency crypto-currency arbitrage trading bot*

- Co-created with Toon Weyens
- Arbitrage trading within and between multiple crypto-currency exchanges
- High-speed data processing and trade evaluation in parallel
- Created cython lock-free parallel orderbook watcher for hundreds of books
- Based on computational sciences & mathematical and physical knowledge
- Supported by modern cryptocurrency financial modelling & deep learning strategies

2018

### **ParaView Python File Readers**

- Implemented a python programmable filter, configured to act as a FileReader
- Easy and performant implementation of readers for arbitrary filetypes in ParaView
- Outperforms previous 3D JOEREK visualisation solution by ~100x

2018

### **Passport Machine-Readable-Zone detection**

- Read the MRZ from passports and ID cards using **Tesseract**
- Works on mobile devices, without installation (for use in progressive web apps)

2017

### **Database design for GKDB**

	<ul style="list-style-type: none"> <li>• GyroKineticDataBase, storing (non-)linear gyrokinetic simulation results for fusion</li> <li>• Flexible storage scheme for different codes implemented in PostgreSQL</li> </ul>
2017	<b>Human-readable compression of <math>1s</math> output: <i>lsdeflate</i></b> <ul style="list-style-type: none"> <li>• Simplify <math>1s</math> output with a compressed format, like file{001..100}.dat</li> </ul>
2017	<b>Low-discrepancy sequences for Monte-Carlo simulations</b> <ul style="list-style-type: none"> <li>• Implemented <i>Sobol' sequence generators in Fortran</i></li> <li>• Improved Monte-Carlo convergence from <math>N^{-1/2}</math> to <math>N^{-1}</math> vs <i>PCG32 RNG</i></li> <li>• Special emphasis on parallel usage with strided generators</li> </ul>
2015	<b>Lets</b> <i>Activity planner for sports and events</i> <ul style="list-style-type: none"> <li>• Notification-based invitation system for events</li> <li>• iOS, Android phonegap apps + web</li> </ul>
2014 - 2015	<b>Owe</b> <i>group payment tracker</i> <ul style="list-style-type: none"> <li>• Track balances between users in a weighted graph</li> <li>• Propose transaction-free settlements</li> <li>• iOS, Android phonegap apps, web portal</li> </ul>
2013 - 2017	<b>RFID payments for PIRAAT</b> <ul style="list-style-type: none"> <li>• Created system for secure storage of account balances and payment by card</li> <li>• Authenticated card charging by servers, analysis tool for treasurer</li> </ul>
2013 - 2014	<b>CCeXchange</b> <ul style="list-style-type: none"> <li>• A trustworthy crypto-currency exchange based in NL</li> <li>• Ruby on Rails, PostgreSQL with a state-of-the-art trade execution engine in C</li> <li>• Abandoned due to regulatory uncertainty</li> </ul>
2012	<b>Ad-hoc mesh network for communication and localisation</b> <ul style="list-style-type: none"> <li>• Useful in situations with poor internet connectivity</li> <li>• Like <i>FireChat</i> (released 2014)</li> <li>• Created feasibility study and intellectual property protection plan</li> </ul>
2010 - 2011	<b>PIRAAT</b> <i>Point-of-Sale system for study association bar</i> <ul style="list-style-type: none"> <li>• Central application server (python) and database with paper trail</li> <li>• Multiple clients (C++, Qt on Windows Embedded CE or Android)</li> <li>• User-interface optimized for efficiency even with large menus</li> <li>• Resilient to network failure</li> <li>• Has processed over 280 000 € in payments</li> </ul>

## SKILLS

### Languages

Dutch	★★★★★★
English	★★★★★★
French	★★★★☆☆
German	★★★☆☆☆
Spanish	★☆☆☆☆☆

## Computer

- **Linux** · Daily operating system (Arch)
- **Vim** · Daily editor
- **LaTeX** · Publication-quality documents
- **Bash, Fish, Make, coreutils, ...** · Daily scripting and development
- **Microsoft Office** · Where useful
- **Git** · For version control of virtually everything
- **ParaView and VTK** · Great 3D visualisation tools
- **HDF5** · TB-scale simulation data storage (with JOEREK)

## Programming

- **Fortran** · HPC application such as **JOEREK** in modern Fortran (2003+)
- **Python** · Numpy, scipy, numba, cython, matplotlib, dask, pandas, asyncio, ...
- **MPI, OpenMP** · Parallelization for HPC
- **Ruby** · Ruby on Rails, tools for web, GPS file analysis
- **MATLAB** · Data analysis, quick computations
- **C** · Computing close to the metal
- **C++** · A higher-level C-like language
- **Mathematica** · Symbolic computing, Fortran code generation
- **PHP, HTML, CSS** · For web development
- **Javascript (JS)** · Interactivity in web pages (with jQuery, React, Angular, Blaze, D3.js)
- **SQL** · With experience in database design and performance optimisation
- **Haskell** · Functional programming
- **Perl** · Perfect for text manipulation

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## AWARDS

2014

**3<sup>rd</sup> Master team in Dutch Physics Competition (PION)**

2009

**1<sup>st</sup> place in United 4 Sailing Splash ranking**

36<sup>th</sup> at Splash world championship

2007

**1<sup>st</sup> place at the German Open Splash sailing championship**

2<sup>nd</sup> place on the European Open Splash sailing championships ladder

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