TOON WEYENS

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Adding value to society with technology is what drives me. My journey started with the study of energy engineering in multiple countries. This taught me how to act like an engineer. Afterwards, I took a deep dive into the physics of nuclear fusion, the most promising source of energy for the future. This taught me how to think like a scientist. It also resulted in a Ph.D. degree, and a postdoctoral Monaco Fellowship to perform research at the outstanding ITER Organization. To satisfy my inner mathematician, without losing sight of what drives me, I finally redirected my career towards Data Science and Artificial Intelligence. This taught me how to operate like a project manager. I now enjoy applying my cross-domain knowledge and competencies at MathWorks, a company that operates between industry and academia, and whose vision I am thoroughly aligned with. At MathWorks, I have the privilege to guide and educate our partners so that they can make the best possible use of our toolset, enabling them to get their projects from idea to application in the most efficient way.

Nationality:	Belgian
Date of birth:	30/12/1987

EXPERIENCE

Jan '19 - Current

Application Engineer, Data Science

MathWorks

- Pre-sale consultancy
- Assist industry and research institutions in adoption of MathWorks products
- Enable them to get projects from idea to application in the most efficient way
- Areas of expertise: Data Science, Internet of Things, Parallel and Cloud Computing and Enterprise Solutions

Jan '17 - Dec '18

Postdoctoral Monaco Fellow

ITER Organization

- Produced multiple first-author publications in quality peer-reviewed journals
- Responsible for investigation of 3-D effects on Edge-Localized Modes (ELM) stability
- Located at multi-billion dollar ITER project, one of world's biggest scientific projects
- Using numerical code PB3D, developed as part of my Ph.D. project (see below)

EDUCATION

Jan '12 - Dec '16

Ph.D.

Universidad Carlos III de Madrid · Eindhoven University of Technology · ITER Organization

- Produced multiple first-author publications in quality peer-reviewed journals
- Designed research project to improve understanding of *high-n* instabilities
- Important class of instabilities in toroidal magnetic confinement devices for nuclear fusion
- Developed dedicated mathematical theory [Weyens et al, 2014, P.o.P, 21, 4]
- Designed optimized numerical code, PB3D [Weyens et al, 2017, J.c.P, 330]
- Used modern Fortran, High-Performance Parallel Computing (HPC) techniques

Sep '10 - Aug '12   **Master of Science - Nuclear Fusion Science & Technology**

Ghent University · Universidad Carlos III de Madrid · Université de Lorraine

- European program in the Erasmus Mundus framework.
- Fusion Engineering & Fusion Science
- Focus on culture and language

Graduated top 5%

Sep '08 - Aug '10   **Master of Science - Energy Engineering**

University of Leuven · Technische Universität Berlin (exchange)

- Multidisciplinary curriculum
- Strong ties to industry
- (Thermo-)Mechanical & Electrical engineering
- Focus on economical aspects of energy
- Personal experience: exchange in TU Berlin for first half of curriculum

Graduated top 15%

December '18   **Online Course - Computability, Complexity & Algorithms**

*Udacity advanced, by Georgia Institute of Technology

- Languages, countability & Turing Machines
- Complexity: P & NP
- Algorithms: dynamic programming, FFT, maximum flow

October '18   **Online Course - Bayesian Methods for Machine Learning** (part of Advanced Machine Learning)

Coursera advanced, by Higher School of Economics Moscow

- Expectation-Maximization (EM) algorithm
- Variational Inference & Latent Dirichlet Allocation
- Markov chain Monte Carlo
- Variational Autoencoder
- Gaussian processes & Bayesian optimization
- PyMC3, GPy, GPyOpt

Graduated with honors

certificate: link

May '18   **Online Specialization - Deep Learning**

Coursera intermediate, by Andrew Ng

- Deep learning foundations by master educator Andrew Ng
- Convolutional neural networks
- Sequence models: RNN, (Bi)LSTM, GRU
- Optimizers: Stochastic, Adam, AdaMax
- Overfitting: dropout, BatchNorm

- TensorFlow & Keras

certificate: link

May '14   **Summer School - 23rd Summer School on Parallel Computing**

CINECA, Casalecchio Di Reno

- 10 day intense graduate HPC course
- Modern parallel computing systems for computation
- HPC introduction, parallel architectures, MPI & OpenMP
- Profilers & debuggers

▬▬▬ PROJECTS

Jan '13 - Current   **PB3D**

Peeling-**B**allooning in **3**-**D**

- Part of doctoral research project
- Capable of efficiently analyzing peeling-ballooning stability of toroidal magnetic confinement devices
- Crucial for nuclear fusion
- Freely available and well-documented

for experts:

- Mathematical mimization of functional, leading to generalized eigenvalue equation
- *high-n* instabilities easily excited, couple plasma (150 million °C) to the cold reactor walls (−260.8 °C)
- General 3-D configurations, perturbed plasma edge [Weyens et al, 2017, J.c.P, 330]
- Postdoctoral research: investigate 3-D effects
  - resonant magnetic perturbations for ELM control (RMP)
  - toroidal field coil (TF) ripple

website: PB3D.github.io

source: github

Feb '18 - Current   **Pylgrim**

Elementary Shortest Path Problem with or without Resource Constraint

- Python implementation of promising algorithms for Elementary Shortest Path Problem (ESPP)
- From recent publications, to benchmark and learn - currently:
  - [Di Puglia Pugliese et all, 2016, Comput Optim Appl, 63]
  - [Boland et all, 2006, Oper Res Lett]
- problem is NP-hard, so efficient solution is interesting mathematical and computational problem

website: github

Jan '18 - Current   **Kraemer**

High-frequency crypto automated arbitrage trader

- Co-creator
- Collaborative project drawing from variety of expertises
- Based on computational sciences & mathematicical and physical knowledge

- Supported by state of the art cryptocurrency financial modelling & deep learning strategies

Oct '18   **Facial Composits: Finding the Suspect**

Capstone project for Bayesian Methods for Machine Learning

- Helps you with getting face of suspect in crime
- Employed variational autoencoder in Keras and Tensorflow to generate face images
- Combined with Gaussian Process Optimization through GpyOpt
- Interacts with you through simple binary *yes*/*no* questions
- Optimized program to require minimal amount of interaction

SKILLS

Languages

English	★★★★★
Dutch	★★★★★
Spanish	★★★★★
French	★★★★☆
German	★★★★☆
Portuguese	★★★☆☆
Italian	★★☆☆☆

Communication

- **Audience Focused Presentation** · TU/e doctoral training course
- **Write to the Top** · Julia Bindmans' course on customer-oriented writing skills
- **Insight Selling** · Michael David Harris' story-telling approach to selling

Computer

- **Linux** · preferred operating system
- **vim** · preferred editor
- **LaTeX** · preferred tool for documents
- **html, CSS** · used for this curriculum vitae (with markdown ➜ Pandoc)
- **git** · ingeniously written collaborative version control
- **jira** · Agile by Atlassian
- **Azure**, **AWS** · Cloud Computing
- **ParaView, VisIt** · favorite 3-D visualization tools, combined with HDF5 and XDMF
- **HDF5 with XDMF** · great data model, both for storage and for visualization
- **Hadoop** · distributed data storage
- **SurfSara** · One of multiple HPC Science Gateways I worked with
- **Office** · Enterprise collaboration tools
- **SalesForce** ·Professional Customer Relationship Management (CRM)

Programming

- **Fortran** · HPC application such as PB3D
- **Python** · numpy, scipy, pandas, cython, aioprocessing, ...
- **MATLAB**, powerful toolset for engineers and scientists: Live Editor, Projects, Parallel and Cloud Computing, Continuous Integration & Version Control, Onramp, CodeGen, WebApps, ...
- **C++** · especially useful paired with the BOOST library
- **TensorFlow**, **Keras** · Deep Learning quick modelling
- **PyMC3**, **GPy**, **GPyOpt** · Bayesian Machine Learning
- **MPI**, **OpenMP** · parallelization for HPC
- **PBS Torque**, **SLURM** · job managers for cluster computing
- **jupyter notebooks** · exploratory programming
- **Bash**, **Make**, **...** · scripting and development

- **MySQL** · simple database
- **LaTeX**, **LuaTeX** · large documents, such as Ph.D. dissertation

Other
- **Fusion DC** 2016 Program Representative
- **TGD Solutions** board member

▬▬▬ AWARDS & SCHOLARSHIPS

2012-2016   **Doctoral Scholarship**

Universidad Carlos III de Madrid, CINECA

PIF scholarship for four years, summer school funding

2017   **Ph.D. Research Award**

European Physical Society

The Plasma Physics Division of the European Physical Society (EPS) shall grant up to four prizes annually to young scientists from the 38 European countries associated with the EPS in recognition of truly outstanding research achievements associated with their PhD study in the broad field of plasma physics

website: EPS

2019   **PyTorch Scholarship Challenge**

Facebook

10k recipients selected worldwide to start using PyTorch for deep learning

website: Udacity

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