

# Lento Manickathan

AEROSPACE ENGINEER · POSTDOCTORAL RESEARCHER

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## Summary

Aerospace Engineer and PhD in mechanical engineering with expertise in high-performance computing and machine learning. Keen at developing skills in computer vision techniques. A brief summary of expertise:

- HPC programming in Python.
- Machine learning with PyTorch.
- CFD simulation with OpenFOAM.
- PIV experimental skills.
- Cloud computing, GPU computing.
- Administration of HPC system.

## Academic & Professional Experience

### Empa (Swiss Federal Laboratories for Materials Science and Technology)

Zürich, Switzerland

POSTDOCTORAL RESEARCHER

Jun. 2019 - Present

- Application of machine learning in quantitative flow visualization.
- Supervised optical flow algorithms for PIV.
- Convolutional Neural Networks (CNN) in PyTorch.
- Additional responsibilities: Lab HPC support, Fluid Tunnel support, Deputy Laser safety officer (LSO), and Deputy data management.

### ETH Zurich

Zürich, Switzerland

SCIENTIFIC ASSISTANT

May 2015 - May 2019

- Numerical and experimental research at Empa.
- Neutron radiography at Paul Scherrer Institute (PSI).
- Teaching assistant for Application of CFD in buildings.
- Supervision of master thesis project: *Praharsh Pai Raikar*.

### Shell Global Solutions

Rijswijk, The Netherlands

RESEARCH INTERN

Sep. 2012 - Feb. 2013

- Investigating the combustion of hydrogen-rich Syngas fuel in gas turbine.

## Education

### ETH Zurich

Zürich, Switzerland

PH.D. IN MECHANICAL ENGINEERING

May 2015 - Jun. 2019

- **Thesis:** Impact of Vegetation on Urban Microclimate.
- **Advisor:** Prof. Dr. Jan Carmeliet
- Development of a coupled soil-vegetation-air-radiation model in C++ within the OpenFOAM library.
- Wind tunnel study of flow past model and natural plants using PIV.
- X-ray tomography of small natural plants and high-performance big data analysis in python (Dask, HDF5, Numba, Scikit-image).

### TU Delft (Delft University of Technology)

Delft, The Netherlands

M.Sc. IN AEROSPACE ENGINEERING

Sep. 2011 - Dec. 2014

- **Major:** Aerodynamics and Wind Engineering
- **Thesis:** Hybrid Eulerian-Lagrangian Vortex Particle Method: Developing a fast and accurate numerical method for the application of Vertical-Axis Wind Turbine (VAWT).
- **Advisor:** Dr. ir. Carlos Simão Ferreira
- Development of a high-performance numerical method in python with Cython and GPU (CUDA) acceleration.

## TU Delft (Delft University of Technology)

B.SC IN AEROSPACE ENGINEERING

*Delft, The Netherlands*

*Sep. 2008 - Aug. 2011*

- **Minor:** Wind Energy and Sustainability
- **Thesis:** Designing a multi-purpose autonomous aerial monitoring aircraft.
- Design a UAV that can cope with severe weather conditions while performing a variety of sensing and monitoring tasks.

## Extracurricular Activities

### Leonardo Times Magazine

EDITOR

*Delft, The Netherlands*

*Sep. 2011 - Aug. 2012*

- Journal of the Society for Aerospace Engineering students, the VSV *Leonardo da Vinci* at the TU Delft.
- In charge of *Current Affairs* section.

### TU Delft Formula Student

POWERTRAIN ENGINEER

*Delft, The Netherlands*

*Sep. 2009 - Jul. 2010*

- In charge of designing the powertrain intake system.
- Design and production of the carbon-fiber intake system.
- *2010 Formula Student Germany Champion.*

## Skills

SCIENTIFIC PROGRAMMING

**CAD** Blender · CATIA

**CFD** FEniCS · Fluent · OpenFOAM

**Programming** C++ · MATLAB · Python · R · Shell

**Python Libraries (HPC)** CuPy · Cython · Dask · H5py · MPI4py · Numba · NumPy · Pandas · SciPy

**Python Libraries (ML)** PyTorch · Scikit-learn

**Python Libraries (Plotting)** Dash · Matplotlib · Scikit-image

SOFTWARE DEVELOPMENT

**Automation** Ansible

**CI / CD** Git (GitHub, Gitlab) · Travis CI

**Cloud** Amazon AWS (EC2)

**Container** Docker · Kubernetes · Sarus · Vagrant

**Database** InfluxDB · MariaDB

**Embedded** Arduino · Raspberry Pi · NVIDIA Jetson Nano

**HPC** SLURM

**Markup / Typesetting** Jinja · LaTeX · Markdown · MkDocs · Vim

**ML Libraries** PyTorch · Scikit-learn

**OS** Linux (Debian, Red Hat) · MacOS · Windows

**Web** CSS · HTML5 · Nginx

## Languages

**English** (Fluent), **German** (Conversational), **Malayalam** (Fluent), **Dutch** (Basic)

## Honors & Awards

2017 **Outstanding Oral Presentation**, 13<sup>th</sup> Symposium on Urban Environment

*Seattle, USA*

2016 **Young Best Researcher**, 4<sup>th</sup> International Conference on Countermeasures to Urban Heat Island

*Singapore*

## Publications

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### Journals

- **Manickathan, L.**, Mucignat, C., Lunati, I. (2022). Random displacement training for fluid flow motion estimation. (*in preparation*)
- **Manickathan, L.**, Defraeye, T., Carl, S., Richter, H., Allegrini, J., Derome, D., & Carmeliet, J. (2022). A study on diurnal microclimate hysteresis and plant morphology of a *Buxus sempervirens* using PIV, infrared thermography, and X-ray imaging. *Agricultural and Forest Meteorology* 313, 108722.
- **Manickathan, L.**, Defraeye, T., Allegrini, J., Derome, D., & Carmeliet, J. (2018). Parametric study of the influence of environmental factors and tree properties on the transpirative cooling effect of trees. *Agricultural and Forest Meteorology*, 248, 259-274.
- **Manickathan, L.**, Defraeye, T., Allegrini, J., Derome, D., & Carmeliet, J. (2018). Comparative study of flow field and drag coefficient of model and small natural trees in a wind tunnel. *Urban Forestry & Urban Greening*, 35, 230–239.

### Preprints

- Palha, A., **Manickathan, L.**, Ferreira, C. S., & van Bussel, G. (2015). A hybrid Eulerian-Lagrangian flow solver. *arXiv preprint arXiv:1505.03368*.

### Conferences

- **Manickathan, L.**, Kubilay, A., Defraeye, T., Allegrini, J., Derome, D., & Carmeliet, J.: Integrated CFD vegetation model with soil-plant-air water dynamics for studying the cooling potential of vegetation in an urban street canyon. *10th International Conference on Urban Climate/14th Symposium on the Urban Environment*, New York, NY, USA, 6 - 10 August 2018.
- **Manickathan, L.**, Defraeye, T., Allegrini, J., Derome, D., & Carmeliet, J.: Conjugate Vegetation Model for Evaluating Evapotranspirative Cooling in Urban Environment. *97th AMS Annual Meeting*, Seattle, WA, USA, 2017.
- **Manickathan, L.**, Defraeye, T., Allegrini, J., Derome, D., & Carmeliet, J.: Aerodynamic characterization of model vegetation by wind tunnel experiments. *4th International Conference on Countermeasures to Urban Heat Island*, Singapore, 2016.