Hugues THOMAS

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Areas of expertise

Computer Vision
Machine Learning
Robotics
Deep Learning
3D data
Points clouds

Languages

French

English

German

Skills

C++

Python

Tensorflow / PyTorch

ROS

Office

AI/Robotics Researcher

Work experience

Postdoc (Feb. 2020 – now) : *University of Toronto, Canada.*

Exploring the application of 3D Deep Learning methods to autonomous indoor navigation at the Autonomous Space Robotics Lab, with Prof. Timothy D. Barfoot. Particular focus on self-supervised learning approaches.

Visiting Student (June – Sept. 2018) : *Stanford University, United States.*

3 months visit in the Geometric Computation group supervised by Prof. Leonidas Guibas. Beginning of a collaboration with Charles R. Qi on point cloud convolutions, leading to a joint publication at ICCV 2019.

Research Engineer (Oct. 2016 – Nov. 2019) : *Terra3D, Paris, France.*

Active member of R&D team in a start up focusing on 3d point clouds processing. Implementation of client oriented solutions, including rail detection with particle propagation, road and curb detection in lidar scans, and segmentation of urban infrastructures in 360° images.

Research intern (April – Sept. 2016) : *INRIA Sophia Antipolis, France.*

Studied people detection in RGB-D data using deep networks. Implemented a detection architecture based on fast R-CNN and a custom bounding box proposal using coherence of depth information. Collaboration with Siyuan Chen on a hand-crafted algorithm for head detection

Research intern (March - August 2015) : *Institut Vedecom, Paris, France.*

Studied road detection and pitch estimation in the context of an autonomous vehicle. Implemented a C++ algorithm based on fusion of camera and gyrometre measures and validated the performances on a real vehicle. Algorithm was integrated to the prototype via RTMaps.

R&D intern (Sept. 2014– Feb. 2015) : *Thales AleniaSpace, Cannes, France.*

Studied the pose estimation of a satellite in the context of a spatial rendez-vous using a camera. Implemented 3 different C++ algorithms and compared their performance on simulation and real robotic test bench.

Teaching

Point clouds and 3D Modeling (2017-2019)
2nd year of M.Sc. MVA, ENS Paris-Saclay, France.

3D Modeling Techniques (2016-2019)
2nd year of M.Sc. MAREVA, Mines Paristech, France.

Associations

Treasurer of the PhD Students Association of Mines Paristech labs (Dopamines) in 2017-18.

Organizer of a ski week for the PhD Students of Mines Paristech labs in 2018.

Interests

Robotics:
Making of a Segway robot in 2012.
Making of a quad-rotor drone in 2016

Sports:
Beach Volley, Volleyball, Rugby

Video Games:
Casual player and interested in game development, personal project of procedural generation.

References

Timothy D. Barfoot.
Professor at University of Toronto (Postdoc supervisor).

tim.barfoot@utoronto.ca

François Goulette.
Professor at Mines Paristech (PhD supervisor).

francois.goulette@mines-paristech.fr

Beatriz Marcotegui.
Professor at Mines Paristech (PhD supervisor).

beatriz.marcotegui@mines-paristech.fr

Leonidas J. Guibas.
Professor at Stanford University (Visit supervisor).

guibas@cs.stanford.edu

Education

Ph.D. 3D Computer Vision (2016-2019) : *Mines Paristech, Université PSL, France*.
Committee: Pascal Monasse, Paul Checchin, Brunot Vallet, Martin Weinmann, Jean-Emmanuel Deschaud, Beatriz Marcotegui, François Goulette
Thesis: *Learning new representations for 3D point cloud semantic segmentation*.

Studied handcrafted features and developed a novel multiscale spherical neighborhood definition to compute features describing 3D points. Using conclusions drawn from handcrafted representations, designed a point convolution operator: KPConv. It uses radius neighborhoods and a set of kernel points to play the role of the kernel pixels in image convolution. This design offers a straightforward deformable extension and very strong performances (ranked first in many benchmarks). Studied the learnt representations to compare with handcrafted features.

M.Sc. Master MVA (2015-2016) : *ENS Paris-Saclay, France*.
Last year specialization in computer vision and machine learning.

École des Ponts Paristech (2012-2016) : *Université Paris-Est, France*.
Top French engineering school (equivalent of M.Sc.Eng.). Majoring mathematics and computer sciences.

Recent publications

H. Thomas, M. Gallet de Saint Aurin, J. Zhang, T. D. Barfoot. Learning Spatiotemporal Occupancy Grid Maps for Lifelong Navigation in Dynamic Scenes. ICRA 2022

H. Thomas, B. Agro, M. Gridseth, J. Zhang, T. D. Barfoot. Self-Supervised Learning of Lidar Segmentation for Autonomous Indoor Navigation. *ICRA 2021*

D. J. Yoon, H. Zhang, M. Gridseth, H. Thomas, T. D. Barfoot. Unsupervised Learning of Lidar Features for Use in a Probabilistic Trajectory Estimator. *ICRA 2021*
(Best Student Paper Award)

H. Thomas, C. R. Qi, J. E. Deschaud, B. Marcotegui, F. Goulette and L. J. Guibas. KPConv: Flexible and Deformable Convolution for Point Clouds. *In The IEEE International Conference on Computer Vision (ICCV)*, 2019.

Invited talks

Self-Supervised Learning for Autonomous Indoor Navigation
Vector Institute, Toronto, Canada *May 2021*

KPConv: Flexible and Deformable Convolution for Point Clouds.
ScanNet Challenge, CVPR 2020 Workshop, Seattle, WA *Jun. 2020*
Stanley Robotics, France *Jan. 2020*
Valeo.ai, France *Dec. 2019*
Ulm university, Germany *Dec. 2019*