Dominic Roberts

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EDUCATION

2016-present **Computer Science PhD Candidate**
University of Illinois at Urbana-Champaign, Urbana, IL, USA.

- Collaborators: Prof. David Forsyth, Prof. Mani Golparvar-Fard.
- Thesis topic: Vision-based productivity monitoring of agents operating in built environments.
- Overall GPA: 3.97/4.00

2014-2015 **MSc in Applied Mathematics**
Université de Lille 1, Lille, France

2011-2015 **MSc in Machine Learning/Data Science**
Ecole Centrale de Lille, Lille, France

2009-2011 **Undergraduate-level math & theoretical physics classes**
Lycée Louis Le Grand, Paris, France

RESEARCH PROJECTS

2019-present **Semantic segmentation of built environments** (with Profs. David Forsyth and Mani Golparvar-Fard)

- ***Motivation:*** Boundaries between different semantic classes in built environments (e.g. curb, sidewalk, building facade) are often highly regular yet this prior knowledge is not exploited in semantic segmentation methods.
- ***Outcome:*** Means of encouraging such regularity in boundaries of outputs of deep learning-based segmentation methods are being devised and implemented.
- ***Skills/Relevant concepts****:* Deep learning, PyTorch, semantic segmentation

2016-2019 **Vision-based activity analysis of construction resources** (with Prof. Mani Golparvar-Fard)

- ***Motivation:*** Manually inspecting construction resource operations is time-consuming and error prone.
- ***Outcome:*** Computer vision frameworks for automatically detecting, tracking and determining construction worker and earthmoving equipment activities in videos were introduced.
- ***Skills/Relevant concepts****:* Object detection, object tracking, action recognition/segmentation, pose estimation, PyTorch, MatConvNet, Caffe

2016-2019 **Annotation tools for visual data of construction sites** (with Prof. Mani Golparvar-Fard)

- ***Motivation*****:** Extant 2D pose ground truth annotation tools for visual data are ill-suited for rapid and accurate annotation of video feeds depicting construction resources at the level of the video frame.
- ***Outcome:*** Tools for crowdsourcing per-frame 2D construction worker pose annotation tasks and aligning virtual construction equipment assets on video frames with images were introduced.
- ***Skills/Relevant concepts:*** Django, Javascript, HTML, CSS, Unity, C#, data curation and collection

SELECTED PUBLICATIONS

(under review) **Synthesizing pose sequences from 3D assets for vision-based activity analysis**
Wilfredo Torres Calderon, *Dominic Roberts*, Mani Golparvar-Fard

2020 **Vision-based construction worker activity analysis informed by body posture**
Dominic Roberts, Shuai Tang, Wilfredo Torres Calderon, Mani Golparvar-Fard
Journal of Computing in Civil Engineering

2020 **Human-object interaction recognition for automatic construction site safety inspection**
Shuai Tang, *Dominic Roberts*, Mani Golparvar-Fard
Automation in Construction

2019 **End-to-end vision-based detection, tracking and activity analysis of earthmoving equipment filmed at ground level**
Dominic Roberts, Mani Golparvar-Fard
Automation in Construction

2019 **An annotation tool for benchmarking methods for automated construction resource pose estimation and activity analysis**
Dominic Roberts, Mingzhu Wang, Wilfredo Torres Calderon, Mani Golparvar-Fard
2019 International Conference on Smart Infrastructure and Construction (ICSIC)

2019 **Annotating 2D imagery with 3D kinematically configurable assets of construction equipment for training pose-informed activity analysis and safety monitoring algorithms**
Dominic Roberts, Yunpeng Wang, Ali Sabet, Mani Golparvar-Fard
2019 ASCE International Conference on Computing in Civil Engineering (I3CE)

2018 **Vision-based construction activity analysis in long video sequences via Hidden Markov Models: experiments in earthmoving operations**
Dominic Roberts, Mani Golparvar-Fard, Juan Carlos Niebles, JunYoung Gwak, Ruxiao Bao:
2018 Construction Research Congress (CRC)

WORK EXPERIENCE

Summer 2020 **Internship at Autodesk AI Lab**, Toronto, Ontario, Canada
- Designed variational auto-encoders for 3D objects whose parts are organized in hierarchies.

Summer 2017 **Internship at AutonomouStuff,** Peoria, IL, USA
- Implemented software capable of detecting & localizing pedestrians, cars and trucks in real time on the NVIDIA PX2

Summer 2015 **Internship at Bluefern Computing Centre,** Christchurch, New Zealand
- Designed software facilitating development of equations modelling neurovascular coupling.

IT SKILL SET

Programming languages:	*Proficiency: Python, C/C++, MATLAB* *Experience with: JavaScript, Java, R, Swift*
Deep learning frameworks:	*Proficiency: PyTorch, TensorFlow* *Experience with: Caffe, MatConvNet*
Other:	*GNU/Linux, Unity, Google Tango, ROS, SQL, HTML/CSS*