Dominic Roberts

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EDUCATION

01/2016-present **PhD in Computer Science,** University of Illinois at Urbana-Champaign, Urbana, IL, USA.
- Advisors: Mani Golparvar-Fard and David Forsyth
- Thesis topic: Vision-based monitoring and design of built environments
- Overall GPA: 3.97/4.00

09/2015 **MSc in Applied Mathematics,** Université de Lille 1, Lille, France

09/2015 **BSc/MSc in Machine Learning/Data Science,** Ecole Centrale de Lille, Lille, France

RESEARCH EXPERIENCE

University of Illinois at Urbana-Champaign, Urbana, IL, USA

Annotation tools for computer vision tasks:

- Built custom Django- and Unity-based tools for crowdsourcing per-frame pose and activity annotation in videos
- Coordinated and QC'd 2000 man-hours of annotation
- Created the largest construction operation footage (bricklaying/plastering/earthmoving cycles) datasets with ground truth among construction research publications

Vision-based activity analysis of construction workers and equipment:

- Designed frameworks for categorizing construction resource activities in individual video frames using SVM/HMMs and Temporal Convolutional Networks, in Matlab/ PyTorch
- Used deep learning object detection (YOLOv3, Faster R-CNN, RetinaNet)/ tracking (FCNT) and pose estimation (AlphaPose, OpenPose)/ tracking (PoseFlow) methods to determine bounding boxes and body joints corresponding to objects of interest
- Obtained state-of-the-art results among construction research publications

Geometric priors for scene understanding of built environments

- Devised means of encouraging boundaries between semantic classes in outputs of semantic segmentation methods (GSCNN, HRNet, PSPNet) to lie along lines
- Used differentiable RANSAC-based methods for semantic line detection in images

PROFESSIONAL EXPERIENCE

05-08/2020 **Research internship @ Autodesk AI Lab**, Toronto, Ontario, Canada
- Developed generative models for 3D part hierarchies that can generate outputs conditioned on levels of detail of other outputs using PyTorch

05-08/2017 **Research Development Internship @ AutonomouStuff,** Peoria, IL, USA
- Implemented models for detecting and localizing pedestrians/cars/trucks, based on YOLOv2, on the NVIDIA PX2

05-08/2015 **Software Engineering Internship @ Bluefern,** Christchurch, New Zealand
- Designed software for development of equations modelling neurovascular coupling

01-07/2014	**Web Development Internship @ Rookiz**, Paris, France • Front-end (HTML/CSS/JavaScript) and back-end (Python/Django) development for a Kickstarter-style crowdfunding website
07-12/2013	**Image Processing Internship @ Arcelor-Mittal,** Maizières, France • Compared software for detecting defects in hot-strip steel from video footage

IT SKILL SET

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

SELECTED PUBLICATIONS

(submitted to CVPR 2021)	**LSD-StructureNet: Modeling Levels of Structural Detail in 3D Part Hierarchies** *D. Roberts*, A. Danielyan, H. Chu, M. Golparvar-Fard
2020	**Synthesizing pose sequences from 3D assets for vision-based activity analysis** W. Torres Calderon, D. Roberts, M. Golparvar-Fard Journal of Computing in Civil Engineering
2020	**Vision-based construction worker activity analysis informed by body posture** *D. Roberts*, S. Tang, W. Torres Calderon, M. Golparvar-Fard Journal of Computing in Civil Engineering
2020	**Human-object interaction recognition for automatic construction site safety inspection** S. Tang, *D. Roberts*, M. Golparvar-Fard Automation in Construction
2019	**End-to-end vision-based detection, tracking and activity analysis of earthmoving equipment filmed at ground level** *D. Roberts*, M. Golparvar-Fard Automation in Construction
2019	**An annotation tool for benchmarking methods for automated construction resource pose estimation and activity analysis** *D. Roberts*, M. Wang, W. Torres Calderon, M. Golparvar-Fard 2019 International Conference on Smart Infrastructure and Construction
2019	**Annotating 2D imagery with 3D kinematically configurable assets of construction equipment for training pose-informed activity analysis and safety monitoring algorithms** *D. Roberts,* Y. Wang, A.Sabet, M. Golparvar-Fard 2019 ASCE International Conference on Computing in Civil Engineering
2018	**Vision-based construction activity analysis in long video sequences via Hidden Markov Models: experiments in earthmoving operations** *D. Roberts*, M. Golparvar-Fard, J. Carlos Niebles, J. Gwak, R. Bao 2018 Construction Research Congress
2017	**Detecting and classifying cranes using camera-equipped UAVs for monitoring crane-related safety hazards** *D. Roberts,* T. Bretl, M. Golparvar-Fard 2017 ASCE International Workshop on Computing in Civil Engineering