Bill Cai

Computer Vision Engineer, Data Scientist

Work Experience

Sep 2018 | Present

Data Scientist, Computer Vision and Deep Learning

One Concern — Menlo Park, California

- One Concern is a benevolent AI company that provides trusted insights that positively impact our communities. Our mission is to drive deep social impact through benevolent intelligence to save lives and livelihoods.
- Technical lead for in-house project to infer built environment and socio-economic features of cities using satellite images. Extensive use of Keras, Tensorflow, PyTorch for deep learning tools. Wrote and built Docker images, with deployment in Kubernetes clusters.
- Coordinated data needs across seismic, flood and wildfire products, and provided technical oversight to deep learning efforts in wildfire prediction and flood modelling projects.
- Customization of open-source Javascript/HTML/CSS image annotation libraries, and deployment on Apache servers on AWS, with integration to Amazon Mechanical Turk.

Sep 2017 | Sep 2018

Graduate Research Assistant, Computer Vision

MIT Senseable City Lab — Cambridge, Massachusetts

- Data mining and labelling, deep learning and computer vision models training, and large-scale deployment to quantify urban canopy cover and parking utilization on large city-wide scales
- Sensor-fusion of lidar and camera data for obstacle detection in autonomous marine vehicle applications in Amsterdam and Boston/Cambridge
- Implemented state-of-the-art CNN architectures for classification, semantic segmentation and instance segmentation, including residual network, Mask-RCNN, PSPNet. Utilized gradient class activation (Grad-CAM) maps to understand learned features
- Extensive use of ROS, including Google Cartographer for SLAM, Velodyne lidar, IMU, USB cameras, for sponsored project by SNCF in Paris

Jun 2017 | Sep 2017

Summer Associate, Product Analytics

Thumbtack — San Francisco, California

- Built live dashboards with Python, R, SQL, Javascript/HTML/CSS to track key metrics
- Modeled two-sided matching and dynamic marketplaces in Python. Our engineering blog post that explains more!
- Analyzed A/B test results to understand impact of product feature changes on customer behavior
- Worked closely with product managers, engineers and designers to shape product decisions

Jun 2016 | Sep 2016

Intern, Social Programmes Directorate

Ministry of Finance — Singapore

- Completed an in-depth study of Singapore's in-depth voluntary retirement scheme and designed A/B testing of potential improvements. Presented findings to Permanent Secretaries

Jun 2015 | Sep 2015

Intern, Futures and Strategy Division

Ministry of Trade and Industry — Singapore

- Analyzed and investigated emerging strategic issues to inform strategic planning

Jan 2014 | Aug 2014

Business Development Lead

Arcstone — Singapore

- Led pitching and sourcing efforts, obtained a seven figure Series AA funding from VCs

Education

Sep 2017 | Sep 2018

M.S. in Computation for Design and Optimization

Center for Computational Engineering, Massachusetts Institute of Technology — Cambridge, Massachusetts

- GPA: 5.00/5.00, thesis on applying computer vision and deep learning for large-scale quantification of urban and city dynamics (advised by Carlo Ratti)
- Selected Coursework: Advances in Computer Vision, Statistical Learning Theory and Applications, Numerical Methods in Partial Differential Equations, Optimization Methods

Sep 2014 | Jun 2017

B.A. in Economics

University of Chicago — Chicago, Illinois

- GPA: 3.87/4.00, Graduated with Phi Beta Kappa (highest honors) and Dean's List from 2014-2017
- Selected Coursework: Planning, Learning and Estimation for AI, Machine Learning, Market Design, Inequality: A Perspective from Macroeconomics, Honors Econometrics, Applied Statistical Modeling

Contact Info

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LinkedIn Profile:
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me@billcai.com

Skills

Python
Tensorflow, Keras, PyTorch
Docker, Kubernetes
Julia, MATLAB, R, Stata, SQL
AWS (EC2, RDS, S3), AWS CLI
ROS, C/C++
Flask, HTML/CSS

Interests

Coding, Programming
Applied Mathematics (Optimization, Numerical PDEs)
Economic Theory (Market Design, Computational Macro)
Reading (Non-fiction)
Basketball (Celtics)
Football (Arsenal)

Presentation and Talks

IEEE BigData Congress 2018 Paper Presentation
MIT CCE Student Seminar 2018

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Ongoing Research, Journal and Conference Publications

Dec 2018 — Quantifying Legibility in Indoor Spaces Using Deep Convolutional Neural Networks: A Case Study in Train Stations
Submitted to Environment and Planning B: Planning and Design
Wang Zhoutong, Liang Qianhui, **Bill Yang Cai**, Louis Charron, Fabio Duarte, Carlo Ratti

Dec 2018 — Deep Learning Architect: Classification for Architectural Design through the Eye of Artificial Intelligence
Submitted to Environment and Planning B: Planning and Design, *arXiv preprint*
Yuji Yoshimura, **Bill Yang Cai**, Wang Zhoutong, Carlo Ratti

Aug 2018 — Deep Learning Based Video System for Accurate and Real-Time Parking Measurement
Submitted to IEEE Internet of Things Journal
Bill Yang Cai, Ricardo Alvarez, Michelle Sit, Fabio Duarte, Carlo Ratti

Apr 2018 — Treepedia 2.0: Applying Deep Learning for Large-scale Quantification of Urban Tree Cover
Published in *IEEE BigData Congress 2018*, *arXiv preprint*
Bill Yang Cai, Xiaojiang Li, Ian Seiferling, Carlo Ratti

Feb 2018 — Using Street-level Images and Deep Learning for Urban Landscape Analysis
Published in *Landscape Architecture Frontiers*
Xiaojiang Li, **Bill Yang Cai**, Carlo Ratti

Research Projects

Sep 2017 | Sep 2018 — Treepedia
Role: Computer Vision and Deep Learning Lead
Treepedia is a project by the MIT Senseable City Lab in partnership with the World Economic Forum to measure canopy cover and green spaces in cities globally. This project has inspired planners and policymakers to design greener cities, and has been featured on the Wall Street Journal, Time, Wired, and Forbes. I developed the Tensorflow-based deep learning algorithms used to detect and quantify canopy cover from Google Street View images, from data annotation to model training/hyperparameter tuning to eventual trained model/library.

Jan 2018 | Sep 2018 — Roboat
Role: Computer Vision Engineer
Roboat is a 5 year research project and collaboration between the Amsterdam Institute for Advanced Metropolitan Solutions and MIT to develop the world's first fleet of urban autonomous floating vessels. Our project has been featured on CNBC, The Verge, Reuters, Quartz, and Fortune. I tuned and deployed Tensorflow-based instance segmentation and object detection models on boat-based GPUs/mini PCs to detect live obstacles, and provide estimated obstacle locations and types to the ROS-based motion planner.

Apr 2018 | Sep 2018 — Space Legibility
Role: Robotics and Computer Vision Lead
Space Legibility is a 2 year project between SNCF, France's national state-owned railway company, and MIT to investigate the interactions between space design and commuter usage in train stations based in Paris. I adapted Google's ROS-based Cartographer library which uses our lab's Velodyne VLP16 Lidar and IMU, in order to provide dense 3D maps of train stations in Paris (Gare De Lyon, Gare St Lazare) as well as MIT's famous infinite corridor.