Bill Cai

Computer Vision Engineer, Data Scientist

Work Experience

Sep 2019 | Present

Computer Vision Scientist
Data Science and AI Division, Government Technology Agency — Singapore

- Govtech Singapore is the technology arm of the Singapore government. The Video Analytics team works on developing and deploying computer vision and video understanding models for social good.
- Lead in-house cloud end-to-end pipeline development, from data annotation to model training, and model deployment on live video streams.
- Extensive use of PyTorch, Tensorflow, Flask, Docker, Kubernetes

Sep 2018 | Sep 2019

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.
- Lead in-house inference of key features from unstructured data. Extensive use of Keras, Tensorflow, PyTorch to build deep learning tools. Wrote and built Docker images, with deployment in Kubernetes.
- 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

Jan 2014 | Aug 2014

Business Development Lead
Arcstone — Singapore

- In-bound sales strategy and investment pitch strategy, 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

Website and Projects:

billcai.com

LinkedIn Profile:

linkedin.com/in/billcai77

Email Address:

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)

Academic Service/Talks

ICLR 2020 Climate Change AI
Program Committee
Reviwer for ICLR 2020, IEEE
Internet of Things Journal
IEEE BigData Congress 2018
Paper Presentation
MIT CCE Student Seminar 2018

Ongoing Research, Journal and Conference Publications

Oct 2019

Quantifying Urban Canopy Cover with Deep Convolutional Neural Networks
Published in NeurIPS Workshop on Climate Change AI
Bill Yang Cai, Xiaojiang Li, Carlo Ratti

Dec 2018

Quantifying Legibility in Indoor Spaces Using Deep Convolutional Neural Networks: A Case Study in Train Stations
Published in Building and Environment
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
Published in Computational Urban Planning and Management for Smart Cities
Yuji Yoshimura, **Bill Yang Cai**, Wang Zhoutong, Carlo Ratti

Aug 2018

Deep Learning Based Video System for Accurate and Real-Time Parking Measurement
Published in IEEE Internet of Things Journal
Special Issue on Enabling a Smart City: Internet of Things Meets AI
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.