Patrick Langechuan Liu, PhD

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WORK EXPERIENCE

Application Development Engineer – Machine Learning Solutions Pleasanton, CA/San Diego, CA
Carl Zeiss, AG May 2017 – Current

- Created and pitched development strategies of machine learning applications in corporate summit meeting.
- Researched and developed deep learning applications for automatic defect detection and image segmentation.
- Optimized and automated semiconductor near-line measurement workflow for X-ray microscopy, and performed gauge studies to ensure repeatability and reproducibility.

Senior Detector Physicist Santa Clara, CA
PerkinElmer Medical Imaging Feb 2015 – May 2017

- Led engineering teams to design and test various amorphous silicon and CMOS detectors for X-ray imaging
- Automated X-ray image classification using deep learning techniques (CNNs) with TensorFlow library, increasing specificity from below 10% to above 80% while maintaining extremely high sensitivity above 99%
- Increased X-ray detector spatial resolution by 80%+ by adopting a barrier rib structure in the scintillator layer; presented the results to senior management as well at international conference in medical imaging
- Invited as associate editor and judge to peer review 90+ manuscripts from 10+ journals in Image Processing and Medical Imaging

Data Science Fellow San Francisco, CA
The Data Incubator Summer 2015

- Performed sentiment analysis through construction of bag-of-words and bigram models based on more than 1 million Yelp reviews using Scikit-learn library in Python
- Predicted business star-rating through linear regression of the features extracted from 30,000+ Yelp records
- Constructed and analyzed a social network of celebrities in NYC using data scraped from 1200+ webpages
- Performed time series forecasting for daily averaged oil spot price using historical data retrieved from Quandl
- Revealed network connections among Wikipedia pages by analyzing internal wiki-links on all simple English and Thai pages (10 GB+ of HTML files stored on Amazon Web Service) using MapReduce in mrjob framework

Research Assistant Ann Arbor, MI
Department of Radiation Oncology, University of Michigan 2009-2014

- Conducted Monte Carlo simulation of various X-ray detector designs on an 800 CPU-core cluster built in house
- Designed and implemented cone-beam CT reconstruction algorithm and volumetric image analysis in MATLAB
- Invented a hybrid modeling framework to reduce simulation time from 100 million down to only 30 CPU hours
- Pioneered design optimization of megavoltage X-ray detectors for radiotherapy portal imaging and MV CBCT

Management Consulting Trainee Chicago, IL
McKinsey & Company Summer 2011

- Created a multivariate regression model to predict sales for a cosmetics company with declining sales in Excel
- Proposed and pitched a solution for increasing sales by ~20% based on the analysis to an executive panel

EDUCATION

University of Michigan, Ann Arbor Ann Arbor, MI, USA
PhD (with distinction) in Physics | GPA: **4.0/4.0** 2008-2014

- Thesis Topic: Cone-beam CT Image Processing and Radiotherapy Imager Design

Peking University Beijing, China
Bachelor of Science in Physics | GPA: **3.7/4.0** 2004-2008

SKILLS & INTERESTS

- Computer Skills: Python, Matlab, Unix Shell Scripting, C, C++, SQL, Git

- Machine Learning: tensorflow, scikit-learn, numpy and scipy
- Languages: Chinese (Native), Japanese (Fluent), Spanish (Intermediate), Arabic (Beginner)
  - Translated the first two seasons of the Big Bang Theory into Chinese and promoted the show in China
  - **1st Place** in Michigan Japanese Language Speech Contest (awarded round-trip tickets from US to Tokyo)
- Interests: Badminton, Table Tennis, Linguistics, Calligraphy, Typography, Manga

ACADEMIC HIGHLIGHTS

Peer-review Experience:

- Invited as associate editor and judge to peer review 80+ manuscripts from 10+ journals in Medical Imaging and Image Processing.

Peer-reviewed Publication:

- Langechuan Liu, Larry Antonuk, Youcef El-Mohri, Hao Jiang, Qihua Zhao, "Theoretical investigation of the design and performance of a dual energy (kV and MV) radiotherapy imager", Medical Physics 42, 2072 (2015) (Featured as **Cover Article** and **Editor's Pick**)
- Langechuan Liu, Larry Antonuk, Youcef El-Mohri, Hao Jiang, Qihua Zhao, "Optimization of the design of thick, segmented scintillators for megavoltage cone-beam CT using a novel, hybrid modeling technique", Medical Physics 41, 061916 (2014)
- Youcef El-Mohri, Larry Antonuk, Richard Choroszucha, Qihua Zhao, Hao Jiang, Langechuan Liu, "Optimization of the performance of segmented scintillators for radiotheraoy imaging through novel binning technique", Physics in Medicine and Biology, 59 (2014) 797-818 (Featured article in **PMB** and **Medical Physics Web**)
- Langechuan Liu, Larry Antonuk, Qihua Zhao, Youcef El-Mohri, Hao Jiang, "Countering Beam Divergence Effects with Focused Segmented Scintillators for High DQE Megavoltage Active Matrix Imagers", Physics in Medicine and Biology, 57 (2012) 5343-58
- Youcef El-Mohri, Larry Antonuk, Qihua Zhao, Richard Choroszucha, Hao Jiang, Langechuan Liu, "Low-dose megavoltage cone-beam CT imaging using thick, segmented scintillators", Physics in Medicine and Biology, 56 (2011) 1509-1527 (Featured in **Medical Physics Web**)

Conferences presentations:

- Langechuan Liu, Minghui Lu, Wanqing Cao, Luke Peng, Arthur Chen, "Improving detector spatial resolution using pixelated scintillators with a barrier rib structure", SPIE Medical Imaging 2016: Physics of Medical Imaging, 978315 (Opening speaker of session)
- Larry Antonuk, Langechuan Liu, Albert Liang, Youcef El-Mohri, Qihua Zhao, Martin Koniczek, Hao Jiang, "Multi-Energy Imagers for a Radiotherapy Treatment Environment", SPIE Medical Imaging 2015, 9412-14
- Larry Antonuk, Langechuan Liu, Youcef El-Mohri, Hao Jiang, Qihua Zhao, "Theoretical Investigation of the Design and Performance of Dual Energy X-ray Detectors for kV and MV CBCT Imaging in a Radiotherapy Treatment Room", RSNA 2014, SSJ21-06
- Langechuan Liu, Larry Antonuk, Youcef El-Mohri, Qihua Zhao, Hao Jiang, "Design Optimization of Segmented Scintillators for Megavoltage Cone-Beam CT", AAPM 2014, TH-A-18C-1
- Langechuan Liu, Larry Antonuk, Hao Jiang, Youcef El-Mohri, Qihua Zhao, "Optimization of the design of portal imaging systems incorporating thick, segmented scintillating detectors employed for megavoltage cone-beam CT through a novel hybrid modeling technique", RSNA 2013, SST15-06
- Larry Antonuk, Youcef El-Mohri, Qihua Zhao, Langechuan Liu, Hao Jiang, "Implications of Orders-of-Magnitude Improvement in DQE Performance of Conventional Electronic Portal Imagers", RSNA 2012, LL-PHS-TH2B
- Larry Antonuk, Langechuan Liu, Qihua Zhao, Youcef El-Mohri, Hao Jiang, Robert Street, "Investigation of Novel, Focused, Segmented Scintillator Geometries for High DQE Megavoltage Active Matrix Imagers", AAPM 2011, Radiography/Projection Imaging Section, SU-C-220-6
- Qihua Zhao, Langechuan Liu, Youcef El-Mohri, Larry Antonuk, Hao Jiang, Martin Koniczek, "Theoretical Limits to System Performance of High Efficiency, Direct Detection, Megavoltage Active Matrix Flat-Panel Imagers Based On Polycrystalline Mercuric Iodide", AAPM 2010, Imaging General Section, SU-GG-I-136