Pankaj Bhambhani

Data Scientist with experience in statistical analysis, Bayesian Inference and Remote Sensing.

pankajb64@gmail.com 413-230-6252 **pankajb64.github.io** **pankajb64** **pankajb64** Cambridge, MA, USA

SKILLS

- **Skills** - Data analysis, Bayesian methods, statistical modeling, machine learning, deep learning
- **Languages** – Python, Scala, Java (Familiarity with C++, Bash, SQL, JavaScript, MATLAB)
- **Libraries/Tools** – Numpy, Scikit-Learn, Pandas, Keras, Stan, Altair, Seaborn, PyTorch, FastAI, Docker, Kubernetes, AWS.

PROFESSIONAL EXPERIENCE

CiBO Technologies, Inc. – Data Scientist Jun 2018 - Present

- Developed a Bayesian model to identify the crop type, planting and harvest date from satellite imagery of agricultural fields. Scaled the model to run across the continental US. We have 2 pending patents, and are drafting a publication.
- Built a Gaussian Process model to interpolate cloudy and missing pixels in satellite images of agricultural fields. The images generated by this model are used to build new CIBO products that are potentially robust to missing satellite data.
- Lead the work on a CIBO algorithm that maps within-field variability using satellite imagery. Designed a numerical score to summarize these maps into a single field-level metric. Wrote a technical blog post explaining this.[1]
- Experience with a variety of geospatial data, including satellite imagery such as Landsat and Sentinel-2, UAV imagery such as Precision Hawk, and other geospatial datasets obtained from USDA, USGS and NASS. Experience with geospatial tools like QGIS and preliminary knowledge of geospatial python libraries such as shapely and geopandas.
- **Skills - Bayesian Inference, Data Analysis, Python, Gaussian Process, Scala, Stan, QGIS, Pandas, Numpy, Altair.**

RESEARCH EXPERIENCE

Fermilab - Deep Skies Group – Independent Researcher Apr 2019 – Dec 2020

- Employed Bayesian Neural Networks (BNNs) on telescope images to learn parameters for theoretical models in astronomy. These models predict the phenomenon of strong gravitational lensing of sources by foreground galaxies.
- Assessed the usefulness of BNNs by studying output distributions and the resulting uncertainties (epistemic, aleatoric).
- Presented my work as a poster at the 236th meeting of American Astronomical Society - see **publication B** below.
- **Skills – Bayesian Neural Networks, Variational Inference, PyTorch, FastAI, Python**

The Dark Ecology Project – Computer Science MS Research Project May 2017 – May 2018

- Helped build machine learning models for biologists to analyze bird migration patterns, using weather radar imagery.
- Contributions include building a benchmark data set and scaling models to run on large volumes of data on AWS.
- Our work was published at the AAAI 2020 conference - see **publication A** below.
- **Skills – Data Analysis, MATLAB, Python, Docker, AWS.**

Environmental effects on Galaxy Population – Astrophysics MSc Thesis Project June 2020 – Present

- For my thesis project, I am studying the correlation between the number density of galaxies in a cluster and the fraction of galaxies that are red (i.e don't form new stars), using data from a large-scale astronomical galaxy survey.
- This is a big data project, and involves statistical analysis, model fitting and Monte-Carlo based parameter estimation.
- **Skills – Data Analysis, Python, Pandas, Numpy, Stan, Altair**

PUBLICATIONS

A. Cheng, Z., Gabriel, S., **Bhambhani, P.**, Sheldon, D., Maji, S., Laughlin, A., & Winkler, D. Detecting and Tracking Communal Bird Roosts in Weather Radar Data. AAAI 2020: 378-385 arXiv:2004.12819 (Computer Science MS Research Project)

B. Poster - **Bhambhani, P.**, Hurd, H. and Caldeira, J., 2020, June. BayesCurve: Read your Strong Gravitational Lens with Bayesian Neural Networks. In American Astronomical Society Meeting Abstracts# 236 (Vol. 236, pp. 241-04). Poster Link - http://bit.ly/poster_aas (Fermilab work)

1. Link to Blog Post https://www.cibotechnologies.com/blog/how-remotely-sensed-performance-zone-maps-improve-agriculture-assessments/

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OTHER PROJECTS

Classification of Astronomical Objects from Light Curves – Kaggle Data Science Challenge Oct-Dec 2018

- Using simulated data from the upcoming LSST telescope, trained a CNN classifier with 60% accuracy across all classes.
- I have been invited to present my work at the upcoming LSST Supernova workshop (postponed due to Covid).
- **Skills – Keras, Sklearn, Pandas, Numpy, Python, Bash.** See **github.com/pankajb64/plasticc-kaggle**

Earthquake Prediction using Acoustic Time-Series Signals – Kaggle Data Science Challenge Feb-Apr 2019

- Trained a Random Forest model to predict earthquake timings using acoustic data simulating seismic waves.
- **Skills – Sklearn, Pandas, Numpy, Python.** See **kaggle.com/pankajb64/shake-it-up**

Learning to improve Product Delivery Schedules – Reinforcement Learning Course Project Dec 2018

- Applied Average Reward Q-Learning to learn better strategies for delivery truck routing and product inventory control.
- **Skills – C++, Numpy, Python.** See **github.com/pankajb64/rl-pdt**

Neural Image Caption Generator – Machine Learning Course Project Oct - Dec 2016

- Analyzed a state-of-the-art LSTM model which generates captions for images; and visualized its inner workings.
- **Skills – Keras, Python.** See **github.com/pankajb64/image_caption_using_attention**

Pictionary with Jibo (a social robot) – HackUMass 2016 Oct 2016

- Trained a CNN model using Jibo API to play Pictionary from line-drawing images with 80% accuracy for common objects.
- **Technologies – TensorFlow, Jibo SDK, OpenCV, Python.** See **github.com/pankajb64/jibo-pictionary**

EDUCATION

University of Massachusetts Amherst, Amherst, USA 2016 – 2018

- MS - Computer Science. GPA – 3.97/4.0

Liverpool John Moores University, Liverpool, UK (Distance Learning) 2019 – Present

- MSc - Astrophysics. Current Marks – 87.6%

Dhirubhai Ambani Institute of Information & Communication Technology, Gandhinagar, Gujarat, India 2009 - 2013

- Bachelor of Technology - Information and Communication Technology. CGPI - 8.62/10