Chetan J. Tonde

CONTACT
INFORMATION

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RESEARCH
INTERESTS

Artificial Intelligence, Machine Learning, Statistics, Theory, Algorithms and their applications in several domains, including, but not limited to, Computer Vision, Multimedia, Network Sciences and Cyber-physical systems.

TECHNICAL SKILLS

- Programming: SQL, MATLAB/Simulink, R, Python, Java, C++, HTML.
- Technologies: Unix, Linux, AWS, Spark, Hadoop, Jupyter, Anaconda, scikit-learn, Caffe, TensorFlow, Keras,

EDUCATION

Rutgers, The State University, New Brunswick, New Jersey USA

Ph.D., Computer Science, May 2016, May 2016.

M.S., Electrical and Computer Engineering, October 2010.

College of Engineering, Pune University, India

B.Tech., Electrical Engineering, October 2008.

WORK
EXPERIENCE

- **Amazon**, Applied Scientist - **(April, 2016 - Present)**.

  - *Distributed Large-Scale Language Model Training* Build large-scale distributed training and system, with a focus on optimizing the training performance for state-of-the-art Transformer-based models on big multi-modal data spanning over text, image, tabular, and graph.
  - *Sponsored Products Product Page Ad Sourcing.* Building Machine Learning/Deep Learning models for Amazon's CPC sponsored advertising team to source relevant ads for Amazon product pages balancing KPI's of revenue, sales, coverage, ROAS and so on.
  - *Impact estimation of catalog improvements of different CQ programs.* Worked on developing impact metrics from raw revenue, predicted by impact attribution models (linear regression), for consumption by CQ managers. Also contributed to investigating and improving the attribution models.
  - *Using product images for detecting duplicate products in Amazon catalog.* Delivered a prototype Random Forest model which used textual attribute features and product image features to detect product duplicates. The model performed with a MAP score of 0.9566 over a baseline score of 0.9498 with 95% statistical significance. Dataset size of 4 million product pairs.
  - *Supply chain optimization and inventory planning* Worked on developing optimization model which optimizes inventory placement of items across Amazon warehouses. The model involved developing a linear optimization model which optimized for customer order fulfillment costs which include labor cost, transportation cost against inventory constraints, capacity, throughput, turns and so on.

- **Amazon**, Machine Learning Scientist Intern at Search and Discovery Technologies. - **(Summer 2015)**.
  Title: *Visual Similarity for Duplicate and Inconsistent Variation Detection.*

- Worked on detecting product duplicates and inconsistent variation product variation families in Amazon catalog. Showed 10-20% recall increase over baseline (40-60%) in several product categories.
- Worked on large scale ML systems (500 million catalog size) with experience in building, deploying and designing solutions that directly impact the company's bottom-line.
- Worked on visualization of large datasets using Java and Python. Demonstrated software best practices using; SOA, software patterns, TDD, continuous deployment and others.
- Demonstrated skills to distill problem definitions, models, and constraints from informal business requirements; and ability to deal with ambiguity and to convey rigorous mathematical concepts and considerations to non-experts.

Mentor: *Eduardo Ruiz-Irigoyen* and **Manager**: *Roshan Ramamohan.*
Linkedin referral: http://www.linkedin.com/pub/chetan-tonde/17/b01/bb6

- **ExxonMobil Corporate Strategic Research**, Summer Research Intern at Data Analytics and Optimization group at Clinton NJ. - **(Summer 2014)**
  Title: *Structure Learning and Inference in Probabilistic Graphical Models with Missing Data.*
  - Developed a novel method to handle missing data under a generic data model as prescribed by a probabilistic graphical model.
  - Derived closed form approximations for the kernel form so as to allow efficient and scalable computations for large scale data.
  - Performed implementation on physical real-world datasets to showing empirical results.

  Supervisor: *Firdaus Janoos* and *Niranjan Subrahmanya.*

RESEARCH
PROJECTS

- **Simultaneous Twin Kernel Learning using Polynomial Transformations for Structured Prediction** - Ph. D Thesis,
  Most *automatic kernel learning* methods face the issue of choosing the right kernel function for best performance. In this work, we propose a novel method to learn a kernel functions for the problem of *structured prediction* using what we call, *polynomial kernel transformations*, these transformations maximize the cross-correlation between inputs and outputs in the feature space using the Hilbert-Schmidt Independence criterion (HSIC). Our proposed algorithm is efficient and scalable -(IEEE CVPR, 2014).

- **DISCOMAX: Distance Correlation Maximization using Graph Laplacians**, We proposed a method to learn input feature representations which *maximizes statistical distance correlation* for *supervised dimensionally reduction* (SDR). We proposed a novel algorithm and demonstrated state-of-the art empirical results for regression.-(Presented at NEML- 2014)

- **CyberPhysical Bike: Approaching Car Detection Using a Rear-looking Camera for Biker Safety**.
  We developed a novel state-of-the-art *real-time, detection and tracking framework for rear-side approaching cars for a bike.* We employ various machine learning techniques to detect and then track rear side approaching cars. We take advantage of computational capabilities of *GPUs using Nvidia/CUDA (C/C++) for real-time performance.* The objective is to later use this information to warn the biker of incoming dangerous situation, if any, based on a 3-feet safety zone rule -(HotMobile, 2011).

- **An Automated, Real-Time Identification and Monitoring of Coral Reef Fish Communities** - MS Thesis.
  We developed a underwater multi-camera imaging system, to recognize and

count fish species found near coral reefs. We built a system to observe a volume of water over a period time and collect data leading to understanding of the effects of environmental changes on those populations. The involved *building a system pipeline of video capturing, pre-processing, segmentation, tracking, pattern recognition and object classification* -(SPIE, 2012).

SELECTED
PUBLICATIONS

- **C. Tonde**, P. Vepakomma, A. Elgammal, *Supervised Dimensionality Reduction via Distance Correlation Maximization*, Electronic Journal of Statistics, Volume 12, no. 1, 960-984, 2018, https://projecteuclid.org/euclid.ejs/1520586206.

- **C. Tonde**, A. Elgammal, *Simultaneous Twin Kernel Learning using Polynomial Transformations for Structured Prediction*, IEEE Transaction on Computer Vision and Pattern Recognition, 2014, http://ieeexplore.ieee.org/document/6909527/.

- P. Vepakomma, **C. Tonde**, A. Elgammal, *DISCOMAX: Distance Correlation Maximization using Graph Laplacians*, Microsoft Research New England Machine Learning Day, http://goo.gl/EOapii

- J. Wilder, **C. Tonde**, et al., *An Automatic Identification and Monitoring System for Coral Reef Fish.* In Proc. SPIE 8499, Applications of Digital Image Processing XXXV, 84991H, Oct, 2012.

- **C. Tonde**, S. Smaldone, V. Koduvayur, L. Iftode, A. Elgammal, *The Cyber-Physical Bike: A Step Towards Safer Green Transportation.* In: HotMobile 2011, 12th Workshop on Mobile Computing Systems and Applications.

PREPRINTS

- **C. Tonde**, Ahmed Elgammal, *Learning Kernels for Structured Prediction using Polynomial Kernel Transformations*, Preprint :arXiv:1601.01411, cs.LG, 2016.

- **C. Tonde**, Edinah K. Gnang, *Combinatorial Constructions for Sifting Primes and Enumerating the Rationals*, Preprint arXiv:1201.1936, math.Co, 2012.

PROFESSIONAL
SERVICE

- Reviewer: BMVC 2019, ICCV 2019, CVPR 2019, CVPR 2018, ECCV 2018, ACCV 2018, TPAMI 2016, INISTA 2015, ISTA 2016, CVPR 2012.

SELECTED
COURSEWORK

Combinatorics - I	Graph Theory	Abstract Algebra
Artificial Intelligence	Machine Learning	Computer Vision
Algorithms - I	Computational Geometry	Applied Algebraic Topology (Audit)

ACADEMIC
EXPERIENCE

Rutgers, The State University of New Jersey, New Brunswick, NJ, USA

TEACHING, (Fall, 2010 - Present, Total = 3 years, 3 months)

- CS521: Linear Programming, Fall 2014.
- CS510: Numerical Analysis, Fall 2012/Fall 2013.
- CS536: Machine Learning, Spring 2012.
- CS205: Discrete Structures - I, Fall 2011, Summer 2013, 2012 (Instructor).
- CS112: Data Structures, Spring 2011.
- CS111: Introduction to Computer Science, Fall 2011.
- PHY205: General Physics 205/206, Fall 2008.

RESEARCH ASSISTANT, (Fall, 2009 - Fall 2010)

- For NSF project titled, 'A System for Automated, Real-Time, Identification and Monitoring for Coral Reef Fish'.