Chintan A. Dalal

% chintandalal.github.io ☑ chintanad@gmail.com Chicago, IL, USA US Citizen

2003 - 2005

1999 - 2003

2013 - 2015

2020

Areas of EXPERTISE

Data Science, Spatiotemporal Statistics, Machine Learning, Geometric Data Analysis, Climate Science, Robotics, Computer Vision, and End-To-End Software Product Development.

PROJECT HIGHLIGHTS I develop data science models for predicting and explaining complex, high-dimensional, and unstructured datasets. Highlights of my contributions towards high-impact applications include:

- Deployed the integrated web application environment of Python, PostgreSQL, and Flask to AWS that provides a plan to maximize the user's travel experience — bit.ly/TripTranscender
- Developed statistical models for various challenges in climate sciences, such as a non-stationary model for future projections, a data-fusion model for inference from multiple sources, and an emulator for Earth System Models — bit.ly/SpatialML
- Benchmarked and improved the performance of machine learning models, such as deep learning and decision trees, for forecasting a quasi-periodic phenomenon
- Developed end-to-end software products for a real-time, large-scale system to provide situational awareness of complex urban environments for unmanned military vehicles

PROGRAMMING SKILLS

Python, R, C++, C, SQL, Java, Matlab, Maple, Perl, HTML, Shell Scripting, TensorFlow, PyTorch, OpenCV, IPP, LaTeX, GAMS, Pro/E, AutoCAD, FPGA, Flask, Git, ArchGIS, CoLab, and AWS.

EDUCATION

Ph.D., Computer Science, Rutgers University - New Brunswick, USA 2011 - 2017 High-Dimensional Manifold Geostatistics (Conferred, Jan 2019) Advisors: Dr. Dimitris Metaxas (Computer Vision, Machine Learning)

Dr. Douglas Nychka (Spatiotemporal Data Science)

M.S., Mechanical Engineering, University of Pennsylvania, USA

Passive Reconfigurable Robots Thesis:

Advisors: Dr. Vijay Kumar (Robotics), Dr. Daniel Lee (Machine Learning)

B.S., Mechanical Engineering, University of Mumbai, India Specialization: Fluid Dynamics

Industry POSITION

Data Science Fellow, Insight, Remote, USA

Role: Deployed end-to-end big data product for planning day trips to

tourist destinations that takes one beyond just the main tourist attractions.

Supervisors: A cohort of data science fellows and industry experts

Senior Software Engineer, General Dynamics Robotics Systems, USA 2006 - 2010

Role: Developed end-to-end software products for providing situational

awareness to unmanned ground, air, and surface vehicles.

Supervisor: Dr. Minbo Shim (Applied Machine Learning), Dr. Barry Bodt (Applied Statistics)

Academic Positions Postdoctoral Research Associate, University of Minnesota - Twin Cities, USA 2018 - 2019

Role: Developed high-dimensional spatiotemporal models, reviewed manuscripts

for machine learning conferences, and wrote grant proposals.

Dr. Arindam Banerjee (Machine Learning)

Predoctoral Research Fellow, National Center for Atmospheric Research, USA 2015 - 2017

Developed novel non-stationary spatiotemporal models and a statistical Role:

emulator for climate data science.

Advisors: Dr. Douglas Nychka, Dr. Claudia Tebaldi (Spatiotemporal Statistics)

Research Fellow, Rutgers University - New Brunswick, USA

Role: Developed high-dimensional manifold models for the areas of national needs,

such as medical imaging, computer vision and sea-level changes.

Advisors: Dr. Dimitris Metaxas, Dr. Vladimir Pavlovic (Machine Learning)

Teaching Assistant, Rutgers University - New Brunswick, USA 2011 - 2013

Role: Developed hands-on educational demos for core computer science courses.

Advisor: Dr. Dimitris Metaxas (Computer Science)

Fellowship Grants

Command, Control, and Interoperability Center

2014 - 2017

for Advanced Data Analysis (CCICADA), Fellowship, Rutgers University Funding Source: U.S. Department of Homeland Security, ~\$90K in award funds A Dept. of Homeland Security fellowship offered to an outstanding doctoral student.

Graduate Assistance in Areas of National Need,

2013 - 2014

Fellowship, Rutgers University

Funding Source: U.S. Department of Education, ~\$30K in award funds

A fellowship offered to support graduate students with excellent academic records.

Awards

Most Notable Paper, Sixth International Workshop on Climate Informatics National Center for Atmospheric Research

2016

Most Notable Paper, Fifth International Workshop on Climate Informatics

2015

National Center for Atmospheric Research

First Place, Autonomous Monster Truck Competition University of Pennsylvania

2004

Industry Research EXPERIENCE

Situational Awareness Software for Unmanned Ground Vehicle

2006 - 2010

General Dynamics Robotics Systems

- Developed a human detection software module from the initial design to the final deployment stage. The theoretical framework was based on a hierarchical Bayesian model. A robust real-time system was achieved by fusing sensor data from multiple-sources, such as a camera, radar and lidar. This module was successfully tested in natural environments including high traffic urban locations.
- Improved the existing theory on a multi-modal mean background model, which led to a robust moving target indicator system.
- Implemented a global optimization technique of simulated annealing for the purpose of real-time image data matching and retrieval.
- Integrated and analyzed a field-programmable gate array, which was configured for the computer vision techniques of optical flow and visual odometry within a large scale autonomous navigation system architecture.
- To further develop this project, I was engaged in the hiring process and training of a new employee for the task of setting up real-time systems, data collection, data wrangling, model testing, and product demos.

Performance Evaluation of Human Detection Systems

2007

General Dynamics Robotics Systems

Designed the experimental setup and evaluation procedures for DARPA's Human Detection Experiment. Results of my analyses were submitted, in collaboration with the National Institute of Standard and Technology and U.S. Army Research Laboratory (ARL), to the Future Combat Systems as a White Paper document.

Autopilot for Unmanned Surface Vehicle

2006

General Dynamics Robotics Systems

Designed and validated control tools based on nonlinear theory for the motion and stability of an unmanned surface vehicle. These tools are currently used by ARL on the unmanned surface vehicles.

Path Planning for Unmanned Air Vehicle

2006

General Dynamics Robotics Systems

Improved the existing implementation of path planning algorithms for unmanned air vehicles.

Academic Research EXPERIENCE

Deep Learning for Seasonal Climate Forecasting

2018

Department of Computer Science, University of Minnesota at Twin Cities Applied long short-term memory neural network for sub-seasonal to seasonal forecasting of an important climate phenomenon of El Niño-Southern Oscillation.

Information Geometric View of Pattern Scaling,

Bayesian Hierarchical Regional Clustering for Climate Model Outputs

IMAGe, National Center for Atmospheric Research

Developed tools for comparing and emulating climate model outputs using Bayesian hierarchical models and information geometry.

Data-mining Tide Gauge Datasets for Analyzing Sea-level Rise

2013 - 2017

2015 - 2017

DIMACS, Rutgers University

Developed models for regional sea-level rise around the US coastline using state-of-the-art statistical techniques.

Reconstructing Spatio-temporal Atlases of the Corpus Callosum

2013

CBIM Center, Rutgers University

Analyzed the data of diffusion tensor images of an aging brain using second-order statistics on the manifold to predict and treat neurological and psychiatric diseases.

3D Pose Reconstruction

2012

CBIM Center, Rutgers University

Implemented a state-of-the-art machine learning technique called the Bayesian mixture of experts for the purpose of reconstructing a 3D human pose from a video sequence.

Passive Reconfigurable Robot

2005

GRASP Laboratory, University of Pennsylvania

Formulated heuristics of a control algorithm based on the theory of Graph Grammars such that the robotic modules would self-assemble into an optimal geometric structure for the task of locomotion.

Cable Robot 2004 - 2005

GRASP Laboratory, University of Pennsylvania

Designed and fabricated the mechanical and electrical components of a cable robot. To localize the cable robot in a 3D space, I implemented the Rao-Blackwellised particle filter.

PUBLICATIONS

Peer-Reviewed Publications

- [P1] Chintan Dalal, Douglas Nychka, and Claudia Tebaldi, Covariance structure analysis of climate model output, Sixth International Workshop on Climate Informatics, 2016. [Most notable paper]
- [P2] Chintan Dalal, Vladimir Pavlovic, and Robert Kopp, Sea level estimation using the Riemannian manifold and a non-stationary covariance function, Fifth International Workshop on Climate Informatics, 2015. [Most notable paper]
- [P3] Jonathan Williford, Chintan Dalal, and Minbo Shim, Spatial multi-modal mean background model for real-time MTI, Proc. SPIE, vol. 7338, pp. 73380A, 2009.
- [P4] Barry Bodt and Chintan Dalal, Performance evaluation of human detection systems, White-paper document, Army Research Lab & General Dynamics Robotics Systems, Maryland, 2007.

Peer-Reviewed Abstracts

[A1] Chintan Dalal, Vladimir Pavlovic, and Robert Kopp, Estimating the ocean surface level using the intrinsic non-stationary covariance function, American Geophysical Union, 2015.

Non-Peer-Reviewed Papers

[N1] Chintan Dalal, Vladimir Pavlovic, and Robert Kopp, Intrinsic non-stationary covariance function for climate modeling, ArXiv e-prints, 2015.

	Papers In Preparation/Submission		
	[I1] Chintan Dalal and Arindam Banerjee, Sub-seasonal to seasonal forecasting for a quasi-periodic phenomena, 2019.		
	[I2] Chintan Dalal, Douglas Nychka, Vladimir Pavlovic, and Robert Kopp, Non-stationary Gaussian process model, 2019.		
	[I3] Chintan Dalal , Douglas Nychka, Vladimir Pavlovic, and Robert Kopp, <i>Multi-source non-stationary Gaussian process model</i> , 2019.		
	[I4] Chintan Dalal, Douglas Nychka, and Claudia Tebaldi, Statistical emulator using m representation of climate model outputs, 2019.		
REVIEWED Conferences	Conference on Neural Information Processing Systems International Conference on Machine Learning	2018 2018	
Presentations	Covariance Structure Analysis of Climate Model Output National Center for Atmospheric Research, International Climate Informatics Workshop	2016	
	Sea-Level Estimation Using the Riemannian Manifold and	2015	
	a Non-stationary Covariance Function		
	National Center for Atmospheric Research, International Climate Informatics Workshop		
	Estimating See Level Distribution	2014	
	Estimating Sea-Level Distribution Rutgers University, Center for Discrete Mathematics and Theoretical Computer Science	2014	
	1040gold chirology, convol for Biscreto Havinomatics and Theoretical Compater Science		
	Non-Linear Dimensionality Reduction	2005	
	University of Pennsylvania, Mathematics Department		
		2015	
Posters	Spatio-temporal Analysis of the Ocean Surface Level Methometrics of Planet Fouth 2012 - Workshop on Management of Natural Resources	2015	
	Mathematics of Planet Earth 2013+ Workshop on Management of Natural Resources		
	Sea-Level Estimation using Intrinsic Statistics and a Non-stationary	2015	
	Covariance Function		
	Carnegie Mellon University, DHS Annual Research Workshop		
	Simultaneous Localization and Mapping for a Cable Actuated Robot	2005	
	University of Pennsylvania, GRASP Laboratory Symposium.	2003	
	Passive Reconfigurable Robot	2005	
	University of Pennsylvania, GRASP Laboratory Symposium		
Teaching Experience	Mentoring Graduate Students, University of Minnesota at Twin Cities	2018	
	Teaching Assistant, Rutgers University 2011	- 2013	
	• Course: Numerical Analysis and Computing	2013	
	• Course: Discrete Structures I	2012	
	• Courses: Introduction to Computer Science, Introduction to Data Structures	2011	
	Average instructor rating from student evaluations: 4/5		
	Prepared educational demos, held recitations, and wrote perl scripts to automate the grading process.		
	one grading process.		
	Teaching Assistant, University of Pennsylvania	2005	
	Course: Statics and Strength of Materials & Mechanics of Materials		
	Lectured classes and live demos for explaining the effects of stress on different materials.		

Papers In Preparation/Submission

2004

Mentoring Undergraduate NSF Summer Fellows, University of Pennsylvania