

# Wei-Ying Wang, Ph.D.

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Providence, RI (willing to relocate)

## SUMMARY

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- Seeking a data scientist position in which I would contribute to the success of a business
- Applied Mathematics Ph.D. with 10+ years experience in programming
- Specialized in data classification and statistical image analysis
- Analyzing large data to develop an image compression algorithm that achieves the best compression rate

## TECHNICAL SKILLS

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<b>Statistics</b>	Mathematical statistics, regression, Bayesian analysis, MCMC, information theory
<b>Machine Learning</b>	Classification, decision tree, random forest, deep learning, SVM, graphical model
<b>Image analysis</b>	Compression, denoising, 3D reconstruction, pattern recognition
<b>Programming</b>	Proficient with: Python(Numpy, Scipy, Keras), Matlab, Latex Experienced with: C/C++, Amazon EC2, R, CUDA
<b>Operating system</b>	Windows, Linux

## EDUCATION

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**Brown University, Providence, RI** Sep 2010 - May 2017  
*Ph.D. Applied Mathematics (GPA: 3.9/4.0)*

- Dissertation: Image Compression and Data Clustering: New Takes on Some Old Problems
- Advisor: Stuart Geman

**National Taiwan University, Taiwan** Sep 2005 - Aug 2006  
*M.Sc. Mathematics/Track of Statistics (GPA: 3.8/4.0)*

- Advisor Ming-Yen Cheng

**National Taiwan University, Taiwan** Sep 2000 - Mar 2004  
*B.A. Economics (GPA: 3.8/4.0)*

## PAPERS

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- **W.-Y. Wang** and S. Geman, "Comparison Based Image Compression." In progress.
  - A novel lossless image compression scheme with analytic performance guarantees
  - Outperforming state-of-the-art algorithms in bit-per-pixel results
  - Implemented with Amazon cloud (EC2) parallel computing (in C and Python) on 80 million image patches (~3.6GB)
- **W.-Y. Wang** and S. Geman, "Robust Generalized Clustering." In progress.
  - A highly robust unsupervised data clustering algorithm which fits multiple structures (even when data is 70% of corrupted)
  - Approximating an NP-hard problem with a modified backward selection procedure
  - Implemented in C and Python (by ctypes module)
- **W.-Y. Wang** and S. Geman, "Clustering to shapes" In progress.
  - An iterative PCA method for clustering high dimensional data into descriptive manifolds

- Capable of obtaining complicated structures, like spiral-shaped data, in a short amount of time
- A novel dimension reduction tool, capable of obtaining complicated structures, like spiral-shaped data, in a short amount of time

## PROJECTS

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### Kaggle competition: Digit Recognizer

- Applying convolution neural network to build a digit classifier from MNIST data (37,800 training data)
- Achieving 99.21% correct rate on 28,000 test data

### Improving 3D Stereo Data with Markov Random Field

- Reducing the mismatching problem when reconstructing 3D images from stereo data
- Applying conjugate gradient to speed up the procedure and obtaining a smooth reconstruction

### Parts-Based Object Detector

- Image recognition with with a hierarchical generative parts model
- 95% accuracy with 10% type I error when data is extremely corrupted (by adding Gaussian noise with variance equals the maximum pixel intensity).
- Implemented with a C++ mex file in Matlab

### 3D Reconstruction with Structured Light

- Reconstructing a 3D image with a camera and structured light from a projector
- Obtaining a high resolution 3D image in a split second

### Statistical Analysis of Non-homogeneous Earthquake Data

- Generalizing kernel density estimation on non-homogeneous Poisson process to analyze aftershocks data
- Reducing the bias of misspecified model without boundary effect

## ACADEMIC EXPERIENCE

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### Brown university

Sep 2016

*Teaching Assistant on: Probabilities in Quantum Mechanics*

- Topics: tensor representation, observable, entanglement, and quantum teleportation

### Brown university

2011 - 2012

*Teaching Assistant on: Statistical Inference*

- Topics: statistical models, point estimator, ANOVA, hypothesis test, and regression

## EMPLOYMENT

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### Academia Sinica, Institute of Mathematics, Taiwan

2008 - 2010

*Research Assistant*

- Utilizing PCA to build an image prior for denoising. Implemented with convolution operations on CUDA (speed up by 300%) in Matlab, made it possible to estimate parameters
- Instructing 20+ lectures on topics of signal analysis: wavelets and multi resolution

### Military Service, Taiwan

2007 - 2008

*Coastal Patrol Corporal*

- Leading about 50 troopers patrolling coastal areas

## HONORS AND AWARDS

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- Sigma Xi National Nomination, Brown University, 2016-2017
- University Fellowship, Brown University, 2010-2017