Gan (Michael) Tu

716 Flores de Oro, S. Pasadena, CA 91030 +1 (626) 628-4911 tugan@berkeley.edu

EDUCATION

University of California Berkeley **Berkeley, CA**

B.A. Computer Science (Honors Program) & Entrepreneurship (GPA: 3.92/4.0) *Expected Graduation: May 2019*

- Current Coursework: Machine Learning, Natural Language Processing, Interface Design, Databases, etc.
- Past Coursework: Microeconomics, Macroeconomics Analysis, Contract Law, International Relations, Digital Marketing, Multivariable Calculus, Linear Algebra, Differential Equations, Discrete Math, Probability Theory, Statistics, Data Structures, Algorithms, Machine Structures, Artificial Intelligence, Signals and Circuits, etc.
- Honors: Presidential Community Service Bronze Award; Dean's Honors; Haas School of Business Dean's Seed Funding Recipient; Dent-Space Payload Competition 1st Prize; Vici Lab Engineering Competition 3rd Prize; Bay BitHack 2nd Prize; European Innovation Academy Accelerator Graduates, etc.

Wharton School of Business **Wharton Online**

Business Foundation, Business Analytics, Entrepreneurship *2014 – 2017*

- Graduated from Wharton Specialization Programs. Earned 12 certificates in areas including but not limited to: Marketing, Operations, Financial Accounting, Corporate Finance, Human Resources, Customer Analytics, Product & Market Strategy, Organizational Structure & Management, Financing, etc.
- Completing Business and Financial Modeling online specialization programs as of now.

ArtCenter College of Design **ArtCenter at Night**

Introduction to Graphic Design; Introduction to Product and Transportation Design *May – Aug. 2017*

EXPERIENCE

Machine Learning at Berkeley **Berkeley, CA**

External Officer & Project Member *Sept. 2016 – Present*

- Collaborated in teams with club members on industry machine learning projects. *(For more, refer to project section)*
- Lead club's marketing and external relations efforts. Secured partnerships and sponsorships from many technology companies, VC firms (i.e. Bessemer), publication press (i.e. O'Reilly), and international AI conferences (i.e. GAITC).
- Improved club brand image nationally and internationally through social media content strategy, website and flyer design, promotion video, marketing campaigns, etc. Increased Facebook Page likes by 50% (~ 700+) in 2 months.
- Worked with the education committee on the introductory machine learning tutorial blogs. Promoted tutorials to be ranked #2 on HackerNews, and #1 on Reddit machine learning sub-reddit thread. Increased 140K+ page views.

Space Technologies at California **Berkeley, CA**

Co-Founder & Software Lead *Sept. 2016 – Present*

- Co-founded the club (stac.berkeley.edu) at UC Berkeley with the mission to create a multi-campus initiative to advance student space exploration and to push technologies that help enable interstellar flight.
- Developed the core club website. Configured and maintained custom email domain and other logistics.
- Assist club management including public relations, funding, sponsorship, marketing initiatives, etc. Secured media coverage and official endorsement by UC Berkeley, in forms including cover story on UC Berkeley official website front page, Alumni committee and Engineering department newsletter, etc.
- Design and co-draft 3+ engineering project proposals, including a 16-page proposal for NASA's CubeSat launch proposal. Secured partnerships across 4+ universities, 3+ laboratories, many researchers and space organizations.
- Won Blue Origin's payload competition. Gained a spot in its New Shepard Space Vehicle to send our microgravity experiments to space with its rocket launch in late 2017. (goo.gl/zIEvwo)

Paradigm Shift **Berkeley, CA**

Business Strategy & Marketing & Software Engineer *May 2016 – Present*

- Paradigm Shift (www.paradigmshiftcs.org) is a student-run, seed funded, nonprofit startup exposing underserved K-12 school students to computer science and careers in tech through locally hosted curriculum and workshops.
- Co-designed our core website and workshops. Co-developed the data structure solutions and auto-graders for our 2048 game project (goo.gl/qznFN), which is selected as one of the top 5 projects of 2017 by Stanford CS Department. Presented at one of the most prestigious education conferences in Seattle: SIGCSE.
- Received $5K Haas Entrepreneurship Dean's Seed Fund. Worked with New England Academy and CalHacks to offer computer science workshops. Working with 6 high schools. Teaching 1100+ students. Rated 9.5+/10 by students and 95% recommended by students.

Deloitte **San Francisco, CA**

Technology Consulting Extern *April 2016*

- Conducted mock client interviews with C-Suite executives to identify business challenge. Performed market analysis and case studies. Learned from senior manager, senior consultant, and consultant analysts.
- Discussed and analyzed main technology trends influencing major industries. Presented advisory solutions based on industry tech trend. Participated in internal case competitions

Finance and Entrepreneurship Club **Berkeley, CA**

Vice President of Business Project & Finance *Sept. 2015 – Aug. 2016*

- Initiated and coordinated club structural and program reforms. Prepared content for club educational programs.
- Taught 32+ students basic financial knowledge in accounting, accounting analytics, corporate finance, and financial modeling. Advised student groups on their entrepreneurial project, product plan and pitch deck.
- Lead fundraising efforts through grants and fundraisers. Raised up to $1524 in one day. Maintained financial statements and relevant mid-year reports and budgets. Managed accounts and processed reimbursements.
- Worked in a 4-people team on a map and directory related entrepreneurial project. Developed business models, financial plans, marketing strategy, logo design, and project reports. Organized sponsorship agreements.

SOFTWARE PROJECTS

Search and Sample Return Challenge

- Inspired by the NASA Sample Return Challenge. Developed algorithms to control a Rover to autonomously map a simulated environment and search for rock samples of interest. (GitHub: goo.gl/3w7JpM; Video: goo.gl/XSMHuX)
- Applied techniques such as perspective transforms, color thresholding, coordinates transformation, and control logic, etc. on vision data from front camera to identify navigable terrain, obstacles, and rock samples of interests.
- My algorithm at best can find 4 rocks, map 60.1% of the simulated environment at 80.7% fidelity under 438 seconds.

Artificial Intelligence System for Pacman (Python)

- Built 5 core graph traversal algorithms for Pacman agents to find paths through random maze world, both to reach a particular location and to collect all food pellets efficiently. (GitHub: code.tugan.me/pacman-ai)
- Developed Minimax/Expectimax search and engineered evaluation functions. Leveraged Markov Decision Process and Reinforcement Learning algorithms like Approximate Q-Learning to help Pacman learn and avoid ghosts.
- Implemented Bayes Nets inference, Exact and Approximate inference, and Particle Filtering algorithms to allow Pacman to locate and eat invisible pellets and multiple invisible moving ghosts efficiently and accurately.

Real-Time Video Labeling (HTML | CSS | JavaScript | NumPy | OpenCV | API | Python | Bash)

- Built a web application that can analyze a given video and provide both label descriptions and timestamps linking to that specific content of the video. Integrated APIs for image analysis. (GitHub: code.tugan.me/video-labeling)
- Programmed functionalities to identify objects in livestream videos with up to 4-second response lags.

NP-Hard Problem Algorithmic Challenge (Unix | Python)

- Implemented and experimented with Hybrid Greedy algorithm, Linear Integer Programming, and Approximate Knapsack to solve 1000+ instances of NP-Hard challenges (hybrid of TSP & Knapsack) under 26 hours with timeout.
- Engineered data structures and systems for overall project solution pipeline and unit testing workflow. Ranked 18 out of 346 teams in terms of the optimality of my solutions. (GitHub: code.tugan.me/np-hard-challenge)

Lane Lines Detection (OpenCV | NumPy | Python)

- Implemented a pipeline that detects highway lane boundaries from front camera video stream and report lane curvature and car center-offset. (GitHub: code.tugan.me/lane-line-detection-advanced)
- Introduced image analysis techniques to calibrate camera and correct image distortion. Combined Sober Filter, alternative color space, Hough Transforms & Canny edge detection for lane detection and curvature measurement.

Vehicle Detection and Tracking (Scikit-Learn | OpenCV | NumPy | Python)

- Implemented a pipeline that detects vehicles from front camera video stream and tracks them with a bonding box.
- Trained a binary vehicle classifier on custom-engineered features such as color histograms and HOG features in alternative color space. Used sliding window search and overlap heat-maps to identify bonding boxes and remove false positives. (GitHub: code.tugan.me/vehicle-tracking)

Runtime Optimization – Performance Programming (C | Python)

- Optimized an image classification convolutional neural network built in C using Intel SSE Intrinsics, OpenMP, loop unrolling, and runtime data cache centric code design. Achieved a speed up of 10x faster runtime.
- Optimized the runtime of a Python script calculating probability density on Cifar10 and MNIST dataset by 24x.

Ataxx AI Board Game (Java | GUI-enabled)

- Designed and engineered all data structures for a 2-person board game: Ataxx. Implemented both custom text-display and GUI support. Packaged all java code into a single executable file. (GitHub: code.tugan.me/ataxx)
- Developed AI-support using Minimax and Alpha Beta Pruning for optional player-to-AI and AI-to-AI game modes.

CPU, ALU, Regfile Design (MIPS | Logism | Circuit)

- Designed and implemented a working 16-bit two-cycle processor that uses a subset of MIPS instructions in Logisim.

DATA SCIENCE PROJECTS

Self Driving Car Behavioral Cloning (Tensorflow | Keras | Python)

- Built and trained two convolutional neural networks, one to predict steering angles from camera images for end-to-end driving in a simulator, and one to classify German traffic signs. (GitHub: code.tugan.me/self-driving-car)
- Visualized convolutional layers to show feature maps. Experimented with different architectures to achieve 94% test accuracy on traffic signs and to smoothly drive around 2 drastically different tracks autonomously.
- Collected training data for behavioral cloning task by manually driving on tracks in simulator. Recollected and redistributed training data based on the insights from autonomous mode performance to remove training bias.
- Performed regularizations, image pre-processing and augmentations to guard against overfitting and help generalize for multiple tracks and traffic signs under different perspective and lighting situations.

IMDB Movie Review Sentiment Classification

- Implemented a simple 3-layer CNN and a multi-layer RNN to predict the sentiment of movie reviews on IMDB.
- Developed the multi-layer RNN with LSTM in TFLearn, trained via Adam Optimizer. Achieved 98.1% test accuracy.
- Hand coded the 3-layer CNN from scratch. Experimented with NLP techniques like Bag of Words, Word2Vec, and one-hot encoding. Sped up training through noise-reduction methods like popularity cut-off, min frequencies, and positive-negative ratio. Achieved 82.2% test accuracy. (RNN: goo.gl/mf64Ov; CNN: goo.gl/usFGx5)

TV Script Generation (Tensorflow | NumPy | Python)

- Implemented a working recurrent neural network architecture that generates new Simpsons TV scripts with proper punctuation and sentence structure after trained on a subset of Simpsons scripts dataset from 27 seasons.

English-to-French Language Translation (Tensorflow | NumPy | Python)

- Engineered and trained a sequence to sequence model on a subset of WMT10 French-English corpus for imperfect translation between English and French sentences with proper punctuation. (GitHub: code.tugan.me/translation)

Face Generation (Tensorflow | NumPy | Python)

- Implemented a Generative Adversarial Network that generates new face images after training on celebrity pictures.

CIFAR-10 Image Classification

- Implemented a multi-layer CNN in Tensorflow to classify images in the CIFAR-10 dataset, consisting of 10 categories of items such as airplanes, dogs, automobiles, and other objects. (GitHub repo: goo.gl/f6wSx6)
- Trained the network on Amazon EC2. Achieved 69.5% test accuracy with a simple CNN structure.

SAP Hana Vora Prefix Sum | Machine Learning at Berkeley | Sept. 2016 – Dec. 2016

- Worked in a team of 7. Introduced Prefix Sum functionality to the SAP Hana Vora (in-memory Hadoop query engine) library. Implemented reward & scan functions for a simple stock trading predictor based on sharp ratio in Apache Spark. (Blog at goo.gl/x9YbUa; GitHub: goo.gl/SyLnES; Slides: goo.gl/9iwgpO; Demo: goo.gl/QbBsg2)
- Implemented & deployed stock scrapers on AWS EC2 to automatically scrap minute by minute trading data from stock charts for all S&P 500 symbols. Collected 5.8 million data points in a SQL database.

Forest Cover Type Prediction

- Participated in the Kaggle competition to predict the forest cover type from strictly cartographic data.
- Experimented with various techniques. Achieved 76.1% test accuracy via Random Forest & feature engineering.

Handwritten Digit Recognition

- Built a multi-layer CNN to identify handwritten digits in MNIST data set. Achieved 97.2% test accuracy.

Cats vs Dogs Image Classification

- Implemented a binary classifier to identify if images contain either a dog or a cat, via a multi-layer CNN with pre-trained VGG16 weights in Keras. Achieved 87.75% test accuracy.

ENGINEERING PROJECTS

2016 Bay BitHack Bitcoin Wallet Project | Major League Hacking

- Won 2nd prize as a 3-people team in the first collegiate, blockchain and cryptocurrencies hackathon. Selected as one of only ten finalists to receive the annual $5K Entrepreneurship Dean's Seed Fund by Haas School in 2015.
- Worked on the back-end using JavaScript to integrate functionalities from BlockCypher, BitPay, and BitCore APIs. Developed a functional multi-signature-encrypted, multi-party, bitcoin wallet. GitHub: goo.gl/IUkZSR.
- The app allows users to join a multi-user bitcoin wallet via an automatically generated QR code, and to send and receive bitcoins using mobile app Copay, only if at least a pre-specified number of users approve the transaction.

2016 Vici Lab WaterSeer Collider Engineering Competition | UC Berkeley Sutardja Center of Entrepreneurship

- Won 3rd prize in the competition hosted by Vici Lab. Its mission is to pioneer low-cost, maintenance-free, easy-to-use technology that provides safe, drinkable water to third world countries. Our report is at: goo.gl/KpOeSB.
- Worked in a team of 4 for 12 weeks. Prototyped working devices that improve and accelerate the extraction of pure water from air through condensation by using both cold-sink thermal mass approach and air-underground temperature gradient approach. Conducted concept design, modeling, business strategy, and the final report.
- Generated 5 design concepts. Manufactured 2 prototypes. Achieved a proof of concept that generates water at least 3.9 liters per day per 9 square-meter surface area, with estimated cost of water production $0.04 per gallon.

ENTREPRENEURSHIP PROJECTS

Co-Founder & Software Developer of Adapt | European Innovation Academy

- Represented UC Berkeley in the world's largest extreme accelerator focused on tech entrepreneurship and innovations. Worked in a team of 5 for 2 months in Nice, France. Mentored by 100+ industry leaders. Conducted customer interviews with 7 small accounting firms from France, US, and Canada.
- Prototyped a minimum viable application as an easy-to-use, affordable document management system that makes the client-to-accountant communication 30% more efficient with better document collection UI/UX experience.
- Lead the front-end web development in Angular.js framework during a 7-day hackathon on product launch.
    - *Problem we are solving*: according to our market research and customer discovery, document collection problem is a two-sided pain in accounting practices. First, clients often do not know what specific types of documents are required due to inefficient communication. Second, when accountants need additional documents, clients do not have documents ready. Third, accounting software is generally expensive and used only by big accounting firms.
    - *Our solution:* Adapt provides an easy-to-use, affordable document management system that allows accountants to list the documents in need and permits the clients to upload them directly. It tracks missing documents and provides better client-to-accountant communication.
    - *Customer Feedback*: "This is a super easy way to save hours of chasing down clients for missing items. I really like the ability to create my own list for my various types of clients we have." -- CPA of a small accounting firm of 12 employees.

ADDITIONAL

- **GitHub**: www.github.com/Michael-Tu; **LinkedIn**: www.linkedin.com/in/gantu; **Personal Site**: michael-tu.github.io
- I *write* on LinkedIn as a millennial voice. Posts are *featured* by LinkedIn Pulse 3 times in 8 categories with 3386+ views, 552+ likes, 89+ shares. To read some or learn more about my professional experience on LinkedIn.
- Current Student of Udacity's Deep Learning, Virtual Reality, and Robotics Nanodegree Programs: goo.gl/8m0E0D.
- Full Stack Web Developer. Developed static sites and web apps in Flask for 4+ college organizations and 3+ companies.
- Proficient in Python, Java, HTML, SQL. Familiar with C++, Tensorflow, CSS, Scheme, Pandas, NumPy, Scikit-learn, MIPS. Basics in Keras, Theano, NLTK, SciPy, Matplotlib, Apache Spark. Know Git, AWS EC2, Angular.js, Flask, etc.
- Bilingual in Mandarin and English; Photographer; Product/Architecture/Graphic Designer; Magician; Pianist; etc.
- I am taking Udacity's Deep Learning, VR, and Robotics Nanodegree Programs as of now.