ILLIDANLAB

Intelligent Data Analytics Lab

Michigan State University, East Lansing Campus

Welcome!

Welcome to the Intelligent Data Analytics (ILLIDAN) Lab!

In ILLIDAN Lab, our main research theme is **Convergent Data Science**: enhancing decision making for data science through establishing the closed-loop flow of informatics among key components of **human**, **data**, and **analytics**. To achieve this goal, we design generalizable, privacy-preserving/fair, robust, and interpretable machine learning algorithms for supporting trustworthy AI systems, especially in health informatics and other scientific areas.

ILLIDAN Lab members have published over 100 peer-reviewed papers in top data mining and machine learning venues (SIGKDD, NeurIPS, ICML, ICLR, etc.), and won the Best Student Paper Award in the 2014 IEEE International Conference on Data Mining (ICDM), the Best Student Paper Award at the 2016 International Symposium on Biomedical Imaging (ISBI), and Best Paper Award in the 2016 IEEE International Conference on Big Data (BigData). ILLIDAN Lab is currently funded by the National Science Foundation, National Institutes of Health, Office of Naval Research, and multiple industry partners.

For more information, please visit the Lab website at **https://illidanlab.github.io/**

Jiayu Zhou, Ph.D.

Associate Professor, Michigan State University
Principal Investigator, ILLIDAN Lab
Co-Founder, I-Connect Foundation (non-profit)

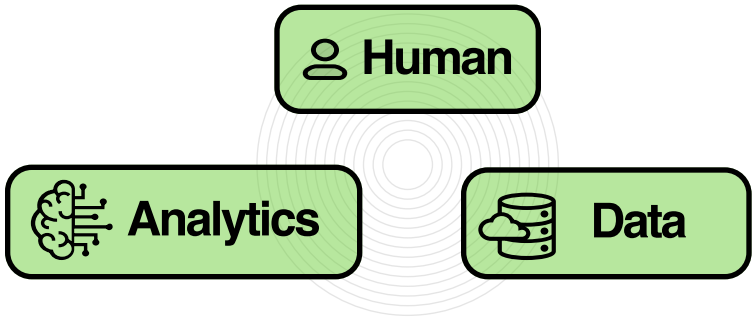
I started my research career back in 2009 when I joined Arizona State University as a doctoral student. I was among the most fortunate and worked with the most exceptional advisor Dr. Jieping Ye. Not only because I received extensive training on data science and machine learning from almost scratch, but more importantly, the value of life, the determination to use my energy and expertise to make this world a better place, and my life experience to influence the future generations.

This belief is why I chose to return to academia and become a professor after spending two years in the Bay Area after I graduate. I joined Michigan State University and started ILLIDAN Lab in 2015, with the mission and passion that I carried all the way from the Arizona heat. Since then, I have been working with talented young students in my lab, witnessing them working hard towards all the research challenges, creating fantastic theories and tools that impact broad domains, and graduating with ultra-sharp problem-solving skills, positive life values, and carrying them to enlight others to change the world with them, just like what I had when I graduated, only better.

This booklet aims to provide anyone interested in what is going on in ILLIDAN Lab. Please check out our website frequently to stay tuned!

Our Vision

Illidan Lab is a global leader in data science research with a vision of **Convergent Data Science**: enhancing decision making for data science through establishing the closed-loop flow of informatics among key components of human, data, and analytics.



- **Consolidation of Data and Analytics.** Many real-world data analytics tasks often involve sparse and noisy data samples from distributed and heterogeneous data sources, which impose significant challenges to existing data analytics approaches. ILLIDAN Lab research focuses on effective information convergence and diffusion for improved model quality: developing information fusion approaches that integrate multiple data sources/views as well as domain knowledge, and information diffusion algorithms that transfer predictive knowledge between related data analytics tasks from centralized or decentralized scenarios.
- **Integration of Human and Analytics.** The human component is perhaps one of the most important factors in data science since humans are data/knowledge providers in most analytic tasks and at the same time consumers of insights from analytics. Our research has also shown that deep integration between the human and analytic components in both the learning and inference stages can greatly benefit analytics. As an example, ILLIDAN lab has been recently developing AI chatbots based on deep reinforcement learning that perform early identification of neurodegenerative diseases through conversations with patients.
- **Resolution of Human and Data.** Data collected from human subjects have demonstrated huge potential in many data science problems. Regardless of the exceptional analytical performance, there are growing concerns about privacy leakage due to the sensitive nature of data. Meanwhile, the bias in the data collection process often leads to fairness issues in the resulting analytic models through imbalanced contribution in the learning process. ILLIDAN Lab focuses on defining privacy and fairness metrics for deep models, improving theoretical understanding of the trade-off among privacy, fairness, and analytical performance, and developing efficient privacy-preserving and fair learning mechanisms.

Many past and current research projects done in ILLIDAN Lab has been closely related to functional approximation, covering supervised learning, reinforcement learning, and also semi-supervised learning.

$$y=f(x)$$

We are interested in studying the following properties of the functional approximation (or learning):

- **Generalization**. One of the most important properties of machine learning models is their prediction performance on unseen data. We are working on algorithms to improve generalization under tough data conditions (e.g., distribution differences or low quality)
- **Robustness**. While some machine learning models deliver high predictive power, they tend to be very sensitive to small perturbations, and thus lacks of robustness. Empowering models with robustness is one major task in ILLIDAN Lab.
- **Privacy**. When training of machine learning models used sensitive data, ILLIDAN Lab studies how much private information is encoded by the model, and how the learning can be done in order to minimally access such private information while maintain good accuracy.
- **Fairness**. When biased data samples are used for training, deploying models learned from such data can result in great ethical issues, creating disparity between social groups and unfairness to certain population. ILLIDAN Lab is developing algorithms to ensure fairness.
- **Interpretability**. ILLIDAN Lab is developing machine learning models that can offer explanations to the rationales behind the complicated decision process of machine learning models.

Especially, in ILLIDAN Lab, we are interested in pursuing these properties in different learning paradigms (e.g., distributed/ federated learning and transfer learning).

Generalization

In ILLIDAN Lab, we have approached the generalization of machine learning models through the integration of different types of knowledge in the learning system and the fundamental approaches to handle low-quality data issues.

Knowledge Integration. Our lab identified three types of knowledge to facilitate generalization:

- **Knowledge from Learning**. Besides our target learning task, we can usually identify related learning tasks or construct relevant learning tasks. ILLIDAN Lab develops transfer learning and multi-task learning approaches to incorporate such knowledge. One example is Subspace Network [1], where we created a deep multi-task learning framework to transfer knowledge among tasks.
- **Knowledge from Data**. In many learning tasks, we usually have different types of data. A major research area of our lab is to develop algorithms for efficiently and effectively fusing different data modalities and sources. In [2], for example, we developed a deep learning framework that learns a shared representation among two types of neuroimaging and genetics.
- **Knowledge from Domain**. Domain knowledge is widely available in many application domains. Whereas the knowledge may not be directly related to the training data, it can typically be incorporated in learning to facilitate model performance through nicely designed formulations. For example, we can integrate temporal smoothness [3, 4] to provide regularization in the medical domain.

Handling Low-Quality Data. Machine learning models are built from training data, and therefore the quality of training data is a decisive factor of the model quality. ILLIDAN Lab has been developing tools for imputing missing data [3, 5], learning algorithms that are robust against noisy training data points [6], and outlier detection [7].

[1] Mengying Sun, Inci M. Baytas, Liang Zhan, Zhangyang Wang, and Jiayu Zhou. "Subspace network: deep multi-task censored regression for modeling neurodegenerative diseases." In Proceedings of the 24th ACM SIGKDD International Conference on Knowledge Discovery & Data Mining, pp. 2259–2268. 2018.
[2] Qi Wang, Mengying Sun, Liang Zhan, Paul Thompson, Shuiwang Ji, and Jiayu Zhou. "Multi-modality disease modeling via collective deep matrix factorization." In Proceedings of the 23rd ACM SIGKDD international conference on knowledge discovery and data mining, pp. 1155–1164. 2017.
[3] Jiayu Zhou, Fei Wang, Jianying Hu, and Jieping Ye. "From micro to macro: data driven phenotyping by densification of longitudinal electronic medical records." In Proceedings of the 20th ACM SIGKDD international conference on Knowledge discovery and data mining, pp. 135–144. 2014.
[4] Jiayu Zhou, Lei Yuan, Jun Liu, and Jieping Ye. "A multi-task learning formulation for predicting disease progression." In Proceedings of the 17th ACM SIGKDD international conference on Knowledge discovery and data mining, pp. 814–822. 2011.
[5] Qi Wang, Pang-Ning Tan, and Jiayu Zhou. "Imputing structured missing values in spatial data with clustered adversarial matrix factorization." In 2018 IEEE International Conference on Data Mining (ICDM), pp. 1284–1289. IEEE, 2018.
[6] Mengying Sun, Jing Xing, Bin Chen, and Jiayu Zhou. "Robust Collaborative Learning with Noisy Labels." In 2020 IEEE International Conference on Data Mining (ICDM), pp. 1274–1279. IEEE, 2020.
[7] Boyang Liu, Ding Wang, Kaixiang Lin, Pang-Ning Tan, and Jiayu Zhou. "RCA: A Deep Collaborative Autoencoder Approach for Anomaly Detection." In Proceedings of the Thirtieth International Joint Conference on Artificial Intelligence (IJCAI–21). 2021.

Privacy, Robustness and Fairness

Nowadays, predictive performance or generalization of machine learning models is no longer the only property desired. In ILLIDAN Lab, we also develop algorithms and theories related to privacy protection, robustness, as well as fairness.

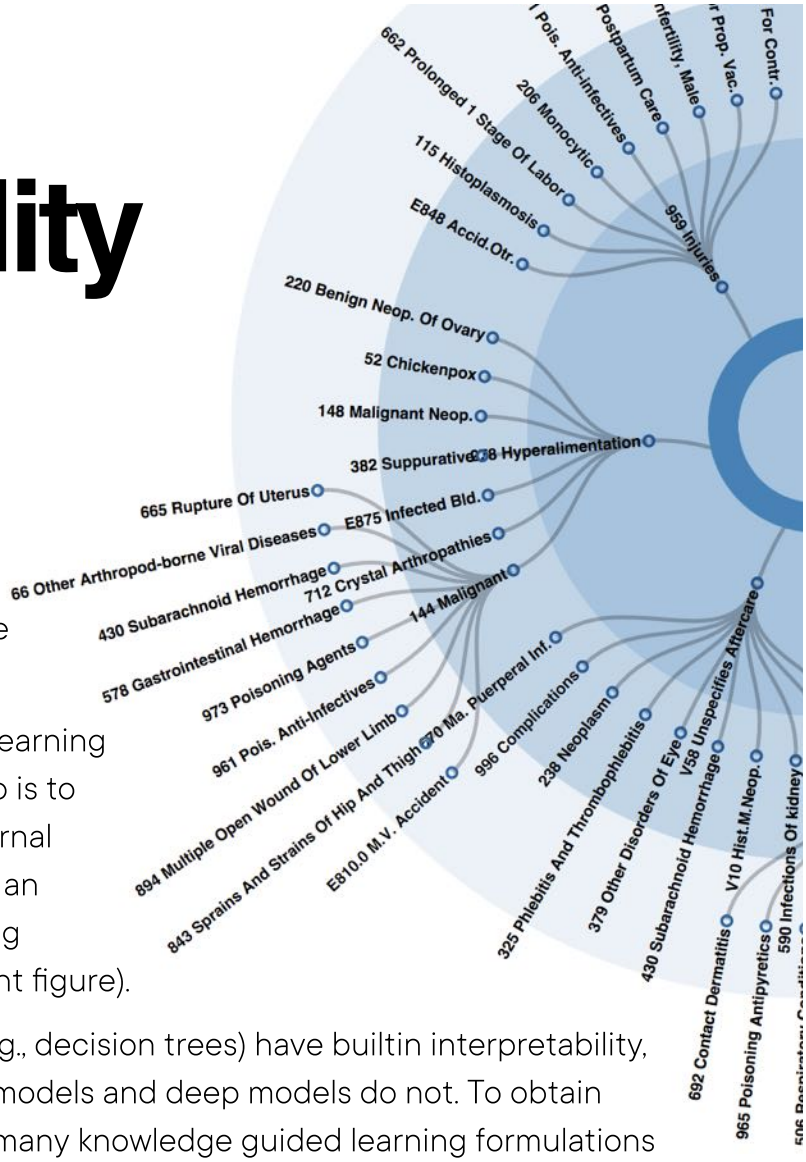
Privacy-Preserving Learning. Computational privacy provides an elegant theoretical framework for accounting privacy leakage during the learning process. In ILLIDAN Lab, we develop algorithms and theories on computational privacy, e.g., privacy-preserving models for generative models [1] and novel theoretical results for improving model utility under controlled budget leakage [2].

Robust Learning Algorithms. There are two types of robustness being studied in our lab. The first type focuses on the robustness of learning processes, where we develop robust algorithms against noisy/polluted samples [3, 4]. The second type of robustness comes from the learned model, where we are interested in models that can help defend against specific attacks or perturbations [5]. We have also leveraged the robustness of models to infer data reliability, which benefits the trustworthiness of prediction models [6].

Fairness in Machine Learning. When the distribution of training data is biased, for example, towards certain gender or age groups (e.g., as a result of biased data collection), then the machine learning models trained using such data is very likely to pick up the biases and lead to disparity when they are deployed in the real-world scenarios. ILLIDAN Lab is developing algorithms to ensure the fairness of the resulting models. For example, in [7], we developed a federated learning framework to learn fair representations that can be transferred or adapted to different domains.

[1] Liyang Xie, Kaixiang Lin, Shu Wang, Fei Wang, and Jiayu Zhou. "Differentially private generative adversarial network." arXiv preprint arXiv:1802.06739 (2018).
[2] Junyuan Hong, Haotao Wang, Zhangyang Wang, and Jiayu Zhou. "Federated Robustness Propagation: Sharing Adversarial Robustness in Federated Learning." arXiv preprint arXiv:2106.10196 (2021).
[3] Boyang Liu, Mengying Sun, Ding Wang, Pang-Ning Tan, and Jiayu Zhou. "Learning Deep Neural Networks under Agnostic Corrupted Supervision." ICML (2021).
[4] Mengying Sun, Jing Xing, Bin Chen, and Jiayu Zhou. "Robust Collaborative Learning with Noisy Labels." In 2020 IEEE International Conference on Data Mining (ICDM), pp. 1274–1279. IEEE, 2020.
[5] Junyuan Hong, Haotao Wang, Zhangyang Wang, and Jiayu Zhou. "Federated Robustness Propagation: Sharing Adversarial Robustness in Federated Learning." arXiv preprint arXiv:2106.10196 (2021).
[6] Mengying Sun, Fengyi Tang, Jinfeng Yi, Fei Wang, and Jiayu Zhou. "Identify susceptible locations in medical records via adversarial attacks on deep predictive models." In Proceedings of the 24th ACM SIGKDD International Conference on Knowledge Discovery & Data Mining, pp. 793–801. 2018.
[7] Junyuan Hong, Zhuangdi Zhu, Shuyang Yu, Zhangyang Wang, Hiroko H. Dodge, and Jiayu Zhou. "Federated Adversarial Debiasing for Fair and Transferable Representations." In Proceedings of the 27th ACM SIGKDD Conference on Knowledge Discovery & Data Mining, pp. 617–627. 2021.

Interpretability



Many application areas in ILLIDAN Lab demand interpretability, either in the learned models or in the decision phase. An example is medical informatics, where physicians are unlikely to trust treatment suggestions by computer models unless they understand the rationale behind the predictions.

Interpreting Data. Before applying machine learning models, one critical but often overlooked step is to deeply dive into the data, unrevealing its internal structures. One example is [1], where we built an interactive visualization tool for understanding clustering structures inside medical data (right figure).

Interpretable Models. While some models (e.g., decision trees) have builtin interpretability, many commonly used models such as linear models and deep models do not. To obtain interpretable models, our lab has developed many knowledge guided learning formulations [2–4] to ensure that the resulting models conform domain knowledge.

Interactive Machine Learning. Enabling machine learning algorithms and models to interact with humans is a critical step to bridge the gap between humans and analytics (see Our Vision). ILLIDAN Lab has developed human-in-the-loop machine learning systems that solicit domain knowledge from experts, represent domain knowledge for learning, use the knowledge to reinforce the learning process, and ultimately deliver interpretable models [5]. On the other hand, to interact with end-users, we are developing medical chatbots that can ask questions to interactively and incrementally acquire feature distribution to make efficient dementia diagnostics.

[1] Inci M. Baytas, Kaixiang Lin, Fei Wang, Anil K. Jain, and Jiayu Zhou. "PhenoTree: interactive visual analytics for hierarchical phenotyping from large-scale electronic health records." IEEE Transactions on Multimedia 18, no. 11 (2016): 2257–2270.
[2] Jiayu Zhou, Lei Yuan, Jun Liu, and Jieping Ye. "A multi-task learning formulation for predicting disease progression." In Proceedings of the 17th ACM SIGKDD international conference on Knowledge discovery and data mining, pp. 814–822. 2011.
[3] Jiayu Zhou, Jun Liu, Vaibhav A. Narayan, and Jieping Ye. "Modeling disease progression via fused sparse group lasso." In Proceedings of the 18th ACM SIGKDD international conference on Knowledge discovery and data mining, pp. 1095–1103. 2012.
[4] Boyang Liu, Pang-Ning Tan, and Jiayu Zhou. "Enhancing predictive modeling of nested spatial data through group-level feature disaggregation." In Proceedings of the 24th ACM SIGKDD International Conference on Knowledge Discovery & Data Mining, pp. 1784–1793. 2018.
[5] Kaixiang Lin, and Jiayu Zhou. "Interactive multi-task relationship learning." In 2016 IEEE 16th International Conference on Data Mining (ICDM), pp. 241–250. IEEE, 2016.
[6] Fengyi Tang, Ikechukwu Uchendu, Fei Wang, Hiroko H. Dodge, and Jiayu Zhou. "Scalable diagnostic screening of mild cognitive impairment using AI dialogue agent." Scientific reports 10, no. 1 (2020): 1–11.

Computing Resources

ILLIDAN Lab is affiliated with the Department of Computer Science, College of Engineering, Michigan State University. All lab members have access to computing resources from ILLIDAN Lab, the College of Engineering, and MSU's High Performance Computing Center (HPCC). Collectively, ILLIDAN Lab members have access to:

56,236 cores
Total CPUs

614
Total GPUs

317 TB
Memory

ILLIDAN Lab members have access to MSU's High Performance Computing Center (HPCC), which maintains four clusters. These clusters comprise a total of 1,047 nodes, which collectively have 56,236 CPU cores, 614 GPUs (including NVidia K20, K80, V100, and V100S models), and 317 TB of memory. The theoretical peak speed of the entire system is approximately 3.9 Petaflops (for double precision floating-point operations; for single precision workloads the number is approximately twice that value). The nodes are connected via low-latency InfiniBand FDR (56 Gbit), EDR/HDR100 (100 Gbit), and HDR (200 Gbit) and share high-speed parallel file systems based on Lustre and GPFS with a total capacity over 8 petabytes for persistent and temporary storage with aggregate performance above 100 gigabytes/sec. Besides, ILLIDAN Lab members have access to Engineering computing servers and more than 10 dedicated GPU servers inside ILLDAN Lab.

IDX ILLIDAN LAB
DOCTORAL TRAINING PHASES

Unleash Your Creativity

Year 1–2
LEARN

New students will get extensive training through mentoring, research seminars, book/paper reading groups, and relevant coursework to strengthen the foundations of data mining, statistics, linear algebra, optimization, and statistical learning theories. Students will also be exposed to a variety of projects, theories or applications, to shape up research capabilities, such as communication, writing, data analysis.

Year 1–4
EXPLORE

We believe that a critical step to really "feel" machine learning is to apply them to real problems. That is why students can choose an active project matching their background and interests (see Projects page), and explore how algorithms really perform, and get an in-depth understanding of their properties. Mentored by Dr. Zhou and/or a senior student in ILLIDAN Lab, this process can help students quickly identify research challenges.

Year 2–5
BUILD

When ILLIDAN Lab students get theoretical training and applied experiences, they become increasingly "productive," developing problem-solving capabilities to quickly propose new solutions to theoretical and methodological problems, leading to impactful technical innovations and high-quality research publications.

Year 3–5
DISCOVER

Over time, the students in ILLIDAN Lab will develop a unique sense of research: identify the research directions that match its research interests and strengths and further develop the capability to ask great research questions. With the combination of the two and the training strategies in LEARN+TRY+BUILD, ILLIDAN Lab members will start to gain research independence, which is the ultimate criteria for graduation.

Projects

ILLIDAN Lab is currently funded by the National Science Foundation, National Institutes of Health, Office of Naval Research, and multiple industry partners. Below are statistics during 2016–2021 and a list of selected federate support.

$ 13.9M

Total Project Support

$ 4.5M

ILLIDAN Lab Share

Selected Federate Grants

- **NIH** Identification of Mild Cognitive Impairment using Machine Learning from Language and Behavior Markers, National Institute of Aging (1RF1AG072449), Leading PI, 2021–2026. $3, 889, 902.31
- **NSF** Intelligent Closed-Loop Neural Interface System for Studying Mechanisms of Somatosen- sory Feedback in Control of Functional and Stable Locomotion, NSF NCS Program (ECCS–2024270), Co-PI, PI Wen Li, 2020–2023. (MSU Portion $305, 999.00)
- **ONR** Deep Learning: Integrating Domain Knowledge and Interpretability, Office of Naval Research (N00014–20–1–2382), Co-PI, PI: Anil K. Jain, 2020–2023. $522, 907.91
- **NIH** Repurpose open data to discover therapeutics for understudied diseases, National Insti- tute of General Medical Sciences (1R01GM134307–01), Co-PI, PI: Bin Chen, 2019 - 2024. $3, 847, 870.75
- **NSF** CAREER: Harness the Big Data via Large-Scale Lifelong Learning, NSF CAREER Program (IIS–1749940), PI, 2018–2023. $551, 685.00
- **NSF** Unsupervised Feature Selection in the Era of Big Data, NSF IIS Core Program (IIS-1714741), Co-PI, PI Jiliang Tang, 2017–2020. $480, 398.00
- **ONR** Large-scale information fusion from multiple modalities, Office of Naval Research (N00014– 17–1–2265), Co-PI, PI: Anil K. Jain, 2017–2020. $525, 000.00
- **NSF** A macrosystems ecology framework for continental-scale prediction and understanding of lakes, NSF MSB Program (MSU Site: EF–1638679), Co-PI, PI Patricia Soranno, 2016– 2020. $4, 257, 250.00 (MSU Portion $2, 041, 750.00)
- **NSF** Structured methods for multi-task learning, NSF IIS Core Program (IIS–1615597), Leading PI, 2016–2019. $496, 933.00 (MSU Portion $250, 050.00)
- **NSF** Integrating domain knowledge via interactive multi-task learning, NSF CRII Program (IIS–1565596), PI, 2016–2018. $174, 883.00
- **ONR** Large-scale metric learning, Office of Naval Research (N00014–14–1–0631), Co-PI, PI: Anil K. Jain 2014–2017. $395, 453.00

Collaboration

ILLIDAN Lab collaborates with many academic units in Michigan State, external institutions, and industry partners. The collaborations bring researchers from various backgrounds and expertise, through which ILLIDAN Lab students will learn to communicate with domain experts and researchers with different training, brainstorm without boundaries, and build connections with lifelong benefits.

Industry Partners

IBM Research

Google

amazon

facebook

SONY

SAMSUNG RESEARCH AMERICA

Tencent 腾讯

JD.COM

DiDi

CyberX

vechain

Academic Collaborations

Cornell University

UNIVERSITY OF ILLINOIS URBANA-CHAMPAIGN

UNIVERSITY OF MICHIGAN

TEXAS The University of Texas at Austin

UC SANTA BARBARA

USC University of Southern California

OREGON HEALTH & SCIENCE UNIVERSITY

NEW YORK UNIVERSITY

UNIVERSITY OF CALGARY

ILLIDAN Family

Graduate Students and Alumni

01/ Kaixiang Lin

First doctoral student in ILLIDAN Lab, joined in 2015. Worked on Multi-task Learning and Reinforcement Learning. Ph.D. graduated in 2020, joined Amazon as a Research Scientist.

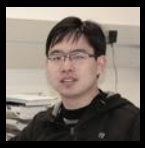
02/ Qi Wang

Joined in 2015. Worked on Multi-view and multi-modality learning, Participated Limnology Project. Ph.D. graduated in 2020, joined Facebook as a Research Scientist.

03/ Inci M. Baytas

Joined in 2015. Jointly advised by Dr. AKJ. Worked on medical Informatics. Ph.D. Graduated in 2019, joined Bogazici University, Istanbul, as a tenure-track Assistant Professor.

04/ Liyang Xie



Joined in 2016. Worked on Multi-task and privacy-preserving learning, Participated in the Intelligent Transportation Project. Master graduated in 2018.

05/ Ike Uchendu

Joined in 2018. Worked on dialogue system and reinforcement learning, Master graduated in 2020, joined Google Brain as an AI Resident.

06/ Fengyi Tang

Joined ILLIDAN Lab in 2016 through DO.-PhD. Program. Worked on medical informatics and dialogue systems, Ph.D. Graduated in 2021, joined Amplitude as a Research Scientist.

07/ Mengying Sun

Joined in 2016. Working on bioinformatics and transfer learning, Participating in project AI x DrugDiscovery. To graduate in 2022, will joined Facebook as a Research Scientist.

08/ Boyang Liu

Joined in 2017. Jointly advised by Dr. PT. Working on robust learning, Participated Limnology Project. To graduate in 2022, will joined Facebook as a Research Scientist.

09/ Zhuangdi Zhu

Joined in 2018. Working on reinforcement and federated learning. To graduated in 2022.

10/ Junyuan Hong

Joined in 2018. Working on privacy-preserving and fairness machine learning, federated learning.

11/ Shuyang Yu

Joined in 2020. Working on transfer learning, domain adaptation, zero-shot learning and drug repositioning.

12/ Yijiang Pang

Joined in 2021. Working on health informatics, robust machine learning, Participating in project: AI x Aging.

14/ Guangliang Liu

Joined in 2021. Working on dialogue systems, natural language processing, Participating in project: AI x Aging.

15/ Zhiyu Xue

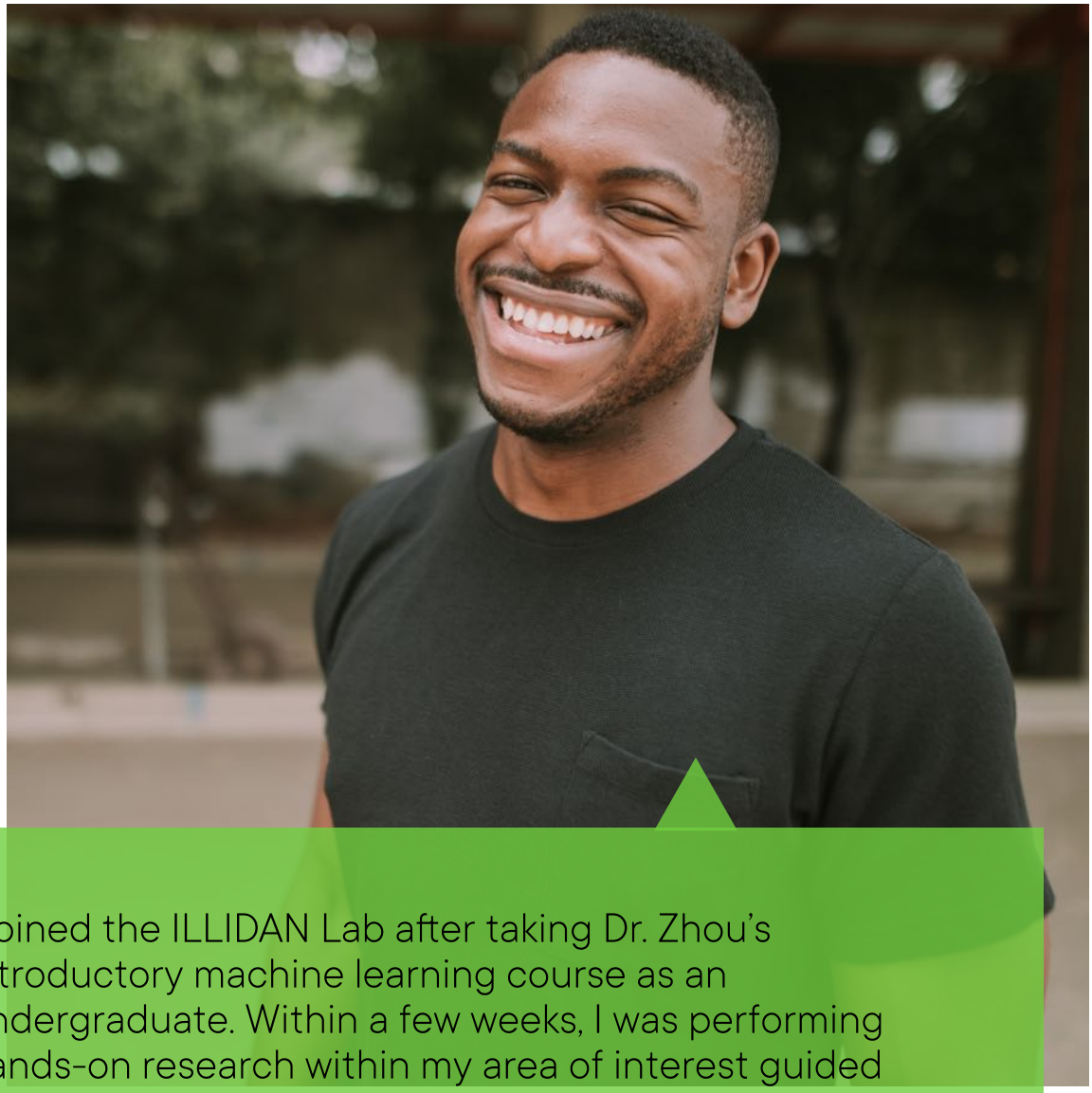
Joined in 2021. Working on fairness machine learning, neural ODE, and time-series analysis. Participating in project: AI x Aging.

16/ New Student

?

ILLIDAN Lab is always recruiting motivated students to work on theoretical and applied machine learning research. Check out requirements in the last section.

Visit lab website **http://illidanlab.github.io** for all members.



I joined the ILLIDAN Lab after taking Dr. Zhou's introductory machine learning course as an undergraduate. Within a few weeks, I was performing hands-on research within my area of interest guided by a senior PhD student. The ILLIDAN lab provides an immersive experience with research through cross-departmental collaborations and seminars where students can present interesting work or technical concepts they want to learn. The frequent and well-planned social events help foster a sense of community where open discussions are encouraged. I am extremely grateful for my time in the ILLIDAN Lab as it prepared me for continuing graduate studies and navigating industry research successfully.

- Ikechukwu "Ike" Uchendu

ILLIDAN Lab Alumni, CS Master, Class'20

First Employment: Google Brain

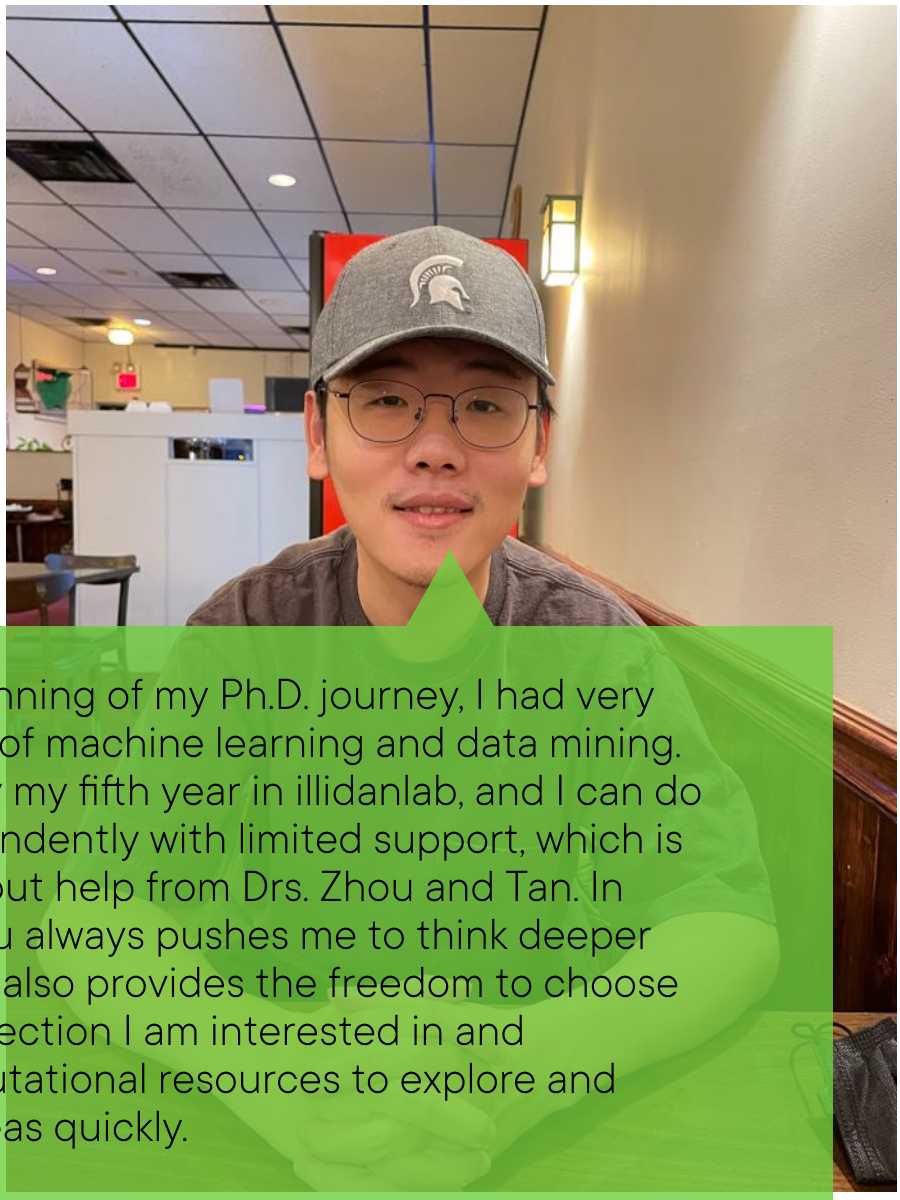
Dr. Zhou persistently guided me on all aspects from motivating a research problem, conducting the research, to writing papers and presenting our works at top conferences. Another signature feature of our lab I like a lot is the vast opportunities to collaborate with active research labs outside of the department/ university such that I have the chance to explore different directions and find the one that most fits me. Finding a proper research direction to work on and consistently pushing it forward is never going to be easy, but with all these flexibility and support from our lab, I was able to figure out a great path for my Ph.D. study and grow steadily towards a good researcher.

I sincerely appreciate the time I spent in the Illidan lab and hope more and more intelligent students can join our group :) For new students that are coming, never worry about anything else besides research, the lab gets you covered!

- Mengying Sun

ILLIDAN Lab Current Ph.D. Student since 2016

Will join Facebook in 2022



At the very beginning of my Ph.D. journey, I had very little knowledge of machine learning and data mining. Now, it is already my fifth year in illidanlab, and I can do research independently with limited support, which is impossible without help from Drs. Zhou and Tan. In ILLIDAN, Dr. Zhou always pushes me to think deeper and broader. He also provides the freedom to choose any research direction I am interested in and sufficient computational resources to explore and validate your ideas quickly.

There are many talented people in ILLIDAN and you can learn a lot from your lab mates. It is easy to be on the right track when you are surrounded by those great minds. Besides research, my advisors and labmates also helped me in other perspectives, and I built great friendships during my Ph.D. life. For those prospective students, I believe you will get an unforgettable experience in your life, and most importantly, ILLIDAN will provide anything it can to help you during this journey.

- Boyang Liu

ILLIDAN Lab Current Ph.D. student, joined in 2017

Jointly advised with Dr. Pang-Ning Tan

In ILLIDAN Lab there is large flexibility in exploring research based on our genuine interests. I obtained full support from Dr. Zhou and another senior student when I decided to research in the field of Reinforcement Learning. Thanks to the collaboration resource of ILLIDAN lab, I got the opportunity to consult with experts from Google Brain. It's ILLIDAN Lab that has helped me realize my potential.

The variety of opportunities and resources that ILLIDAN Lab provides is impressive. At our lab seminars, students can discuss the most state-of-the-art advances in machine learning, share their individual research progress, or just reserve a focus time to dive deep into fundamental principles in optimization, learning theory, etc. The rich hardware and software resources here makes it unimpeded for students to realize their research ideas. The warm and caring culture makes us feel supported all the time. It is a great place for PhD students to develop their skills and mindset for research. I feel grateful to be a member of the ILLIDAN Lab.

- Zhuangdi "Judy" Zhu

ILLIDAN Lab Current Ph.D. Student

[Up] IllidanLab x BinLab Team Building, Airsoft Match, Fall 2021
[Mid.L] IllidanLab x BinLab Team Building, Bowling, Spring 2020
[Mid.R] IllidanLab Team Building, Escape Room, Spring 2018
[Down] IllidanLab Celerabtion Dinner, Summer 2019

LIFE x Play @ ILLIDAN

In ILLIDAN Lab, we believe in **happiness,** as we are most productive when we are happy. This is why we play very hard outside of research and enjoy every minute of our lives.

East Lansing Campus

ILLIDAN Lab is located at the main campus of Michigan State University at East Lansing. This page briefly introduces the wonderful place that we study and live.

East Lansing is located east of Lansing, the state capital of Michigan. Places around MSU Campus offer unlimited possilities. From rock climbing in the country at dawn to cocktails on a rooftop bar at dusk, there are places and spaces to explore your true self.

Downtown Lansing, Credit: Lansing501.com

Upper Michigan. Credit: Matt Anderson, Flickr

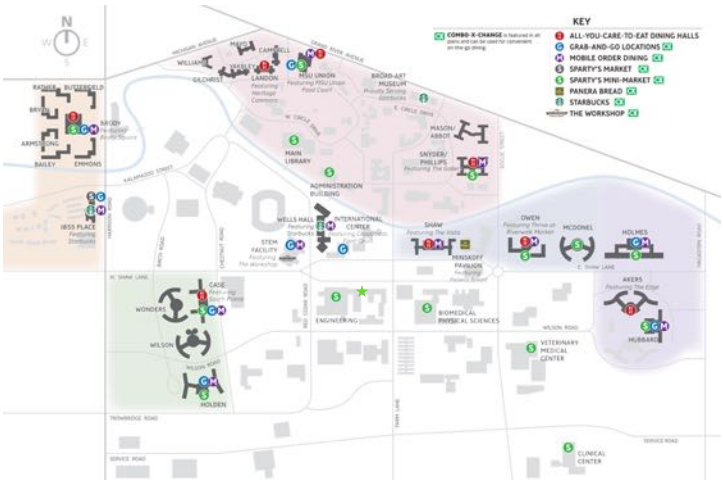
Grand Haven, Michigan. Credit: visitgrandhaven.com

Safe Campus. Michigan State has more than 80 sworn police officers certified by the State of Michigan on campus. Additional campus safety and security services include late night transport/ escort service, 24-hour emergency telephones, lighted pathways/sidewalks and controlled residence hall access. For more details check: https://admissions.msu.edu/life-at-msu/campus-safety

East Lansing Campus Cont.

Dining halls. MSU East Lansing Campus is featured by a variety selection of residential dining halls. Each neighborhood offers a diverse menu of options, including comfort food, grill items, international cuisine, desserts, pizza, breakfast items and more! https://eatatstate.msu.edu/

MSU East Lansing Campus dining halls



Campus dining hall locations, star is the location of ILLIDAN Lab

Restaurants. Besides dining halls, East Lansing has offered a great selections of food, such as Chinese, Korean, Thai, Indian, Mediterrian, and American. For example, there are 29 Chinese resturants and 7 milktea brands near the campus.

Maru Sushi & Grill, East Lansing

Royal Pot, East Lansing

Tangy Crab, Lansing

Harpers, East Lansing

Living Expenses. East Lansing is cheaper than the US average. On average, the rent cost is $1024 for 2 bedrooms (most typical plan) at East Lansing, breaking down to ~$500/mo per person. Check out here: https://www.bestplaces.net/cost_of_living/city/michigan/east_lansing

Join Us!

Funded Doctoral Students

Intelligent Data Analytics (ILLIDAN) Lab has multiple fully-funded Ph.D. positions in Computer Science available. The area is theoretical and applied machine learning research. Ideal candidates are expected to have the following qualities:

- BS or above degrees in Computer Science, or related areas (e.g., Electrical Engineering, Automation, Mathematics, Statistics, Operational Research)
- Have a strong motivation in academic research;
- Excellent problem-solving capability;
- Solid mathematical background (including but not limited to probability, linear algebra, optimization);
- Experienced programming skills;
- Effective communication skills;
- A Master's degree in computer science or related areas is strongly preferred, but exceptional undergraduate students with extensive research experiences are also encouraged to apply.

Interested applicants please send your CV, Transcript, and a research statement to Dr. Jiayu Zhou (email: jiayuz@msu.edu). Due to COVID situation, GRE is currently not required as a part of admission process.

We will contact shortlisted candidates for interviews. The first interview involves a presentation of an assigned research paper and research discussions. Once passed the first interview, Dr. Zhou will contact the candidate for a second interview on research topics. Candidates typically receive immediate decisions after the second round. The first interview is typically conducted in late Nov, Dec and early Jan, but exceptional candidates will be considered all year round.

Post-doc Positions

ILLIDAN Lab has openings for post-doctoral researchers at various levels. Please send your CV and three (3) representative publications to Prof. Jiayu Zhou.