Zhihua Lai (PhD)

Senior Software Engineer at **Microsoft Research Cambridge** (MSRC), A Top 3
Steem Blockchain Witness (Block Producer), Ex-Amazon/Ex-General-Electric.
Passionate for Algorithms, Blockchain and Cloud (ABC).

Profiles › [@ MSRC](https://www.microsoft.com/en-us/research/people/zhihualai/) › **Github @ DoctorLai** › Personal Page: `https://zhihua-lai.com`

I am currently a Senior Software Engineering in **AFO (Azure For Operators)** in **Microsoft Research Cambridge** where I contribute and build high performance software (C, eBPF) that run on 5G Base Stations.

During the employment with Amazon, I have contributed to development of several large scale distributed applications in the domain of AWS (Amazon Web Services) e.g. **S3 Simple Secure Storage**. I have worked from Day 1 at **S3 Object Lambda** and witnessed the **successful launch** of it (Mar-18-2021).

During the employment with General Electric, I have added the _while loop, regular expression, http library, jwt APIs and many other features to the Magik compiler (**Wiki**).

During the employment with Ranplan Wireless, I have designed and implemented the cutting-edge Intelligent Radiowave Propagation Engine that is pushed to its limits by using Win32 inline Assembly in the core. See `https://ranplanwireless.com/`

Over the years, I am passionate about computer algorithms, and I have quite a few patents on intelligent radiowave propagation algorithms. I am quick to learn, determined to tasks and work efficiently in design, implement, test and document.

In High School (2002), I have won the third prize on NOI programming contest i.e. National Olympiad Informatics.

I am a **TOP 3 Witness** aka Block Producer of the Steem Blockchain. I am beknown for the contributions (infrastructure, tools, API and services) to the Steem Blockchain. See `https://steemyy.com`

At my spare time, I contribute to open source projects such as Tron Blockchain (java-tron), Ledger Wallet (app-tron C) and Steem Blockchain (steemd C++).

▬▬▬▬ Job Experience

Senior Software Engineer at *Microsoft (Cambridge, UK)* 2021/07 to Present: **AFO (Azure For Operators)**, **Microsoft Research Cambridge**

- Technology: Linux (BASH), C, C++, eBPF, 4G/5G, O-RAN, Azure (AKS, K8S, Azure Functions, Service Bus, Pipeline …), Python, Go, C#, NodeJS, Rust etc.
- Microsoft Technical Report: **Taking 5G RAN Analytics and Control to a New Level**, December 2022
- ACM MobiCom'23: **Taking 5G RAN Analytics and Control to a New Level**
- ACM MobiCom'23: (*Best Demo Award Runner-Up*), **Programmable RAN Platform for Flexible Real-Time Control and Telemetry**
- ACM MobiCom'23: **Accelerating Open RAN Research Through an Enterprise-scale 5G Testbed**

Software Development Engineer at *Amazon AWS (Cambridge, UK)* 2020/01 to 2021/07: SDE (L5) = Someone Does Everything = Full Stack Software Engineer + On-Call Duties

- Technology: Java/RxJava, Python, Ruby, Javascript (Node, Vue.Js), AWS S3, EC2, CloudFormation, API Gateway, Lambda, DynamoDB, CloudWatch, Step Function, CDK/LPT…

Highlights of contributions:

- Working on S3 Object Lambda from Day 1! `https://aws.amazon.com/s3/features/object-lambda/`
- Built the internal tooling to track the performance of S3 - the largest distribute storage product in the world. Automated categorization of issues and performance bottlenecks in a very large distributed system help engineers identify and address the problem.

Staff Software Engineer at *General Electric (Cambridge, UK)* 2018/12 to 2020/01: It has been a tremendous success for me as I have learned a lot, improved myself and become confident in the GE Smallworld technology stacks. I have merged 165+ PRs and completed 92+ stories (25 Pull Requests Merged in First 3 Months), and have contributed quite a few to the smallworld products (Smallworld GIS Software core and other components)

- Technology: BASH, C/C++, Javascript (NodeJS), Java and Magik; REST API, OAuth2 (UAA), Docker, Kubernetes Clusters.

Highlights of contributions:

- I added the while loop to the Magik programming language.
- I added the regular expression to the Magik programming language.
- I designed and implemented the HTTP library.
- I designed and implemented the JWT (Json Web Token) library - used in UAA Authentication
- I implemented the Magik Random Interop Library that improves the performance and fix the multithreading race condition problems
- I added the Magik URL validation library in the core
- I contributed to the development of the outbound/inbound framework
- I contributed to MUnit testing framework

Principal Algorithm Engineer at *Ranplan Wireless (Cambridgeshire, UK)* 2010/09 to 2018/11: I am one of the lead developers for this product (C#7, .NET4.7): `https://ranplanwireless.com/products/` and I design, develop and maintain the core library (Radio Propagation engine). It is a 500K LOC code base that consists of Visual Studio C++ 2017, Delphi 10.2 Tokyo with some Inline Assembly and some VBS/JS.

Key result areas included:

- To supportthe development of Ranplan in-house ray tracing model
- To lead cutting-edge channel modelling algorithms and techniques
- To train and share all knowledge of algorithm in radio propagation channel modelling
- To provide level 3 support and customer consulting project services
- To contribute to Ranplan Patents

Highlights:

- Core developer of the flagship product: The Author of Ranplan Radiowave Propagation Model (one of my babies): My overall job purpose was to provide and implement my algorithm research expertise in developing Ranplan Radio Propagation Model (RPM) which is one of Ranplan's key intellectual property.
- Lead a Propagation Team e.g. Rewrite RPM in C++.
- OpenCL GPU Implementation of Vector Ray Launching Propagation Algorithms.
- Prototyping the Geo-localization algorithm using KNN and other machine learning algorithms.
- Develop the 32/64-bit cutting-edge wireless radiowave propagation engine (plugins, scripts) using C++, Delphi and Inline Assembly.
- Research, bug-fixes and development for an indoor wireless planning tool using C#.
- Develop and maintain web-based licensing software using PHP + MySQL + Javascript.
- Develop Hundreds of Unit Tests and Integration Tests in C# and VBScript.
- Develop More than 1500 APIs using Delphi (Win32/64 COM Library).
- Develop Tools of Statistics and Code Quality on Jenkins Continuous Server Powershell.
- Develop Smart/Intelligent algorithms to convert clutter GIS data to vector building data.
- Develop various GIS conversion/cropping tools using C# ie. GeoConverter.

Marie Curie Experienced Researcher at *University of Sheffield, UK* 2013 to 2015: Development of tools for the design of wireless and energy efficient buildings; in charge of high frequency ray tracing tools. **WIFEEB Grant ID: 286333**

Awards

- 2002: ACM - National Olympic Informatics (NOI), Third Prize by China Computer Federation & NOIP Orgranisation Committee
- 2001: ACM - Fujian Olympic Informatics (FOI), Third Prize by Fujian Education Federation & Fujian Science Orgranisation

Patents

- PCT/GB2015/053224, Zhihua Lai etc., Method for Predicting Outdoor Three-Dimensional Space Signal Field Strength By Extended Cost-231-Walfisch-Ikegami Propagation Model, US Patent Application No. 15/522,728, Claimed Filing Date: 27 October 2015.
- PCT/GB2015/053223, Zhihua Lai etc., Method for Predicting Indoor Three-Dimensional Space Signal Field Strength Using An Outdoor-To-Indoor Propagation Model, US Patent Application No. 15/522,735, Claimed Filing Date: 27 October 2015.
- *And a few others.*

Education and Awards

2006-2010   **PhD, Computer Science and Wireless**; University of Bedfordshire (UK)

Thesis title: The Development of an Intelligent Ray Launching Algorithm for Wireless Network Planning

- *2013*: Top 30 iPinyou Global RTB Bidding Algorithm Contest (season two offline) (rule based Simulate Annealing heuristic algorithm)

- *2009*: Marie Curie Fellowship for Transfer of Knowledge by University of Applied Sciences of Western Switzerland

2004-2006 **BSc, Computer Science (First Class, Score 15.51 out of 16)**; University of Luton (UK)

Thesis title: Chinese Chess

- *2004*: National Computer Rank Programming Contest, Top 30 by National Education Examinations & China Education

Technical Experience

I have developed/maintained the Serverless Load Balancers for STEEM Blockchain (RPC Nodes)

- AWS Lambda
  - https://x68bp3mesd.execute-api.ap-northeast-1.amazonaws.com/release
  - https://e51ewpb9dk.execute-api.us-east-1.amazonaws.com/release
- Microsoft Azure Function
  - https://justyy.azurewebsites.net/api/steem
- Cloudflare Worker
  - `https://steem.senior.workers.dev`

Other side projects/tools/libraries/APIs:

- A set of Steem Block Chain Tools: `https://steemyy.com`
- A few useful Chrome Extensions and Online/Web Tools: `https://helloacm.com/tools/`
- A few APIs: `https://helloacm.com/list-of-apis/` and **Blockchain APIs**
  - **Crypto API**
  - **Sudoku API**
- SteemVBS: `https://github.com/DoctorLai/steemvbs` which is the VBScript library to connect to steem blockchain.
- Online Video Downloaders and APIs - `https://weibomiaopai.com` and the popular **Simple Video Downloader**
- **npmjs packages**

Open Source Most of my tools are open source and I constantly find bugs and create issues or PR to other open source libraries. My github id is **doctorlai** and my NPM-Js ID is **justyy**. I was also a Utopian Moderator (Rewarding Open Source Contributor on Steem Blockchain). A few Pull Requests that I have contributed: `https://steemyy.com/others.php#pr`

Selected Publications

- **Accelerating Open RAN Research Through an Enterprise-scale 5G Testbed**, In The 29th Annual International Conference on Mobile Computing and Networking (ACM MobiCom'23), October 2-6, 2023, Madrid, Spain. ACM, New York, NY, USA. `https://doi.org/10.1145/3570361.3615745`
- **Programmable RAN Platform for Flexible Real-Time Control and Telemetry**, In The 29th Annual International Conference on Mobile Computing and Networking (ACM MobiCom'23), October

2-6, 2023, Madrid, Spain. ACM, New York, NY, USA. https://doi.org/10.1145/3570361.3614065 - **Best Demo Award Runner-Up**

- **Taking 5G RAN Analytics and Control to a New Level**, In The 29th Annual International Conference on Mobile Computing and Networking (ACM MobiCom'23), October 2-6, 2023, Madrid, Spain. ACM, New York, NY, USA, 16 pages. https://doi.org/10.1145/3570361.3592493
- **Taking 5G RAN Analytics and Control to a New Level**, Technical Report | December 2022
- Chapter 2 - Radio Propagation Modelling, in Book "Heterogeneous Cellular Networks: Theory, Simulation and Deployment", Cambridge University Press, 2012.
- Chapter 5 - Outdoor-Indoor Channel, in Book "LTE-Advanced and Next Generation Wireless Networks: Channel Modelling and Propagation", John Wiley & Sons, November, 2012.
- **Intelligent Ray Launching Algorithm for Indoor Scenarios**, Radioengineering, Towards EUCAP 2012: Emerging Materials, Methods, and Technologies in Antenna & Propagation, Volume 20, Number 2, 2011, ISSN: 1210-2512, p.p.:398-408.
- The Development of a Parallel Ray Launching Algorithm for Wireless Network Planning, International Journal of Distributed Systems and Technologies, IGI, DOI: 10.4018/jdst.2011040101, Volume 2, Issue 2, 2011.
- Indoor Massive MIMO Channel Modelling Using Ray-Launching Simulation, International Journal of Antennas and Propagation, Volume 2014 (2014), Article ID 279380.
- Joint Ray Launching Method for Outdoor to Indoor Propagation Prediction Based on Interpolation, The Ninth European Conference on Antennas and Propagation, EUCAP, IEEE, Lisbon, Portugal, April 12-17, 2015.
- Joint Ray Launching Method for Indoor to Outdoor Propagation Prediction Based on Ray Aggregation, The Ninth European Conference on Antennas and Propagation, EUCAP, IEEE, Lisbon, Portugal, April 12-17, 2015.
- Implementation and Validation of a New Combined Model for Outdoor to Indoor Radio Coverage Predictions, Hindawi Publishing Corporation EURASIP Journal on Wireless Communications and Networking, 2010: 215352.
- Modelling the mmWave Channel Based on Intelligent Ray Launching Model, The Ninth European Conference on Antennas and Propagation, EUCAP, IEEE, Lisbon, Portugal, April 12-17, 2015.
- Implementation and Validation of a 2.5D Intelligent Ray Launching Algorithm for Large Urban Scenarios, The Sixth European Conference on Antennas and Propagation, EUCAP, IEEE, Prague, Czech Republic, March 26-30, 2012,ISBN: 978-1-4577-0919-7.
- Antenna Height Compensation for an Indoor to Outdoor Channel model based on a 2D Finite Difference Model, 29th Progress In Electromagnetics Research Symposium, Marrakesh, Morocco, March 20-23, 2011.
- A New Deterministic Hybrid Model for Indoor-to-Outdoor Radio Coverage Prediction, The Fifth European Conference on Antennas and Propagation, EUCAP, IEEE, Rome, Italy, April 11-15, 2011, ISBN: 978-88-8202-074-3, p.p.:3771-3774.

Worth mentioning

- My propagation model 'IRLA' has been cited in the book "Femtocells - Technologies and Deployment", John Wiley & Sons, ISBN: 978-0-470-74298-3.
- I write highly-optimized code (which uses less memory and executes faster). For example, for Problem 1532 on ACM Timus Online Judge, my submission ranks the second. The maximum time allowed is 4 seconds but my algorithm executes in 0.312 seconds. http://acm.timus.ru/rating.aspx?space=1&num=1532&count=100

- I run a delegated service on steem blockchain **@justyy** where Steemians delegate their Steem Power to me and my bots send out the Steem Dollars (tokens) at a rate of 8% to 10%. Also my bots are up running 24/7 to vote the quality posts of the delegatees.
- I am currently the 4-th most delegated account on the STEEM Blockchain e.g. 300+ delegations according to `https://steemyy.com/top-delegations-by-count/`
- I run **@dailychina** where the algorithms select top 10 quality posts and reward them daily (very popular and postive feedbacks received).
- I develop **@fairlottery** (Blockchain Lottery) and **@witnesstools** (Steem Blockchain Gambling).
- I write discord/telegram bots that distribute test coins (TRX, USDT, USDC, USDD) on Tron Blockchain (Shasta and Nile Test Net).
- I develop and run Simple Token Swap Tools on Multiple blockchains: **Steem To Ethereum**, **Steem to Bitshares**, **Steem to TRON** and **Steem to USDT**.
- I develop and run Account Registration Services on Steem Blockchain: **Register a Free Account on Steem Blockchain**.
- I develop the **Steem Blockchain Explorer**.

My Other Activities

- 2019-11 to 2019-12: I taught the course *Microbit Programming* at weekends in Chesterton Community Colleage (organised by Chinese Family Together and Hacklab Cambridge) to kids (8 yrs+).
- I teach my sons programming videos which are uploaded to youtube: `https://zhihua-lai.com/teaching/`

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Reference provided on requests.