

# Subhadip Mitra

*Engineering Leader & AI Systems Architect*

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## Professional Summary

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Senior Engineering Leader with 15+ years of experience bridging fundamental AI research and enterprise-scale system delivery. Currently leading Google Cloud's Data & Analytics practice for Southeast Asia while driving internal innovations on LLM inference efficiency and multi-agent systems. Proven track record of operating as a "Player-Coach": managing regional engineering portfolios while simultaneously architecting and patenting novel frameworks (UPIR, ARTEMIS, FTCS, Speculative Decoding).

## Professional Experience

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**Google Cloud - Professional Services Organization: Data & Analytics Manager — Site Lead, PSO Southeast Asia** *January 2021 – Present*

Dual-track role combining technical innovation leadership with regional delivery management. Built Google Cloud's Data Analytics practice across Southeast Asia while serving as Site Lead overseeing cross-practice operations. Member of delta - Google Cloud's innovation and transformation team architecting enterprise AI solutions at scale.

### Strategic Leadership & Delivery:

- Built Data Analytics practice for Southeast Asia from 0 to 1, establishing the region's premier capability serving 7 countries with strategic enterprise clients.
- Serve as Site Lead overseeing PSO Southeast Asia delivery operations, directing cross-functional teams while maintaining 97% CSAT and contributing to 100% annual revenue target attainment.
- Direct \$XXM+ Data Analytics delivery portfolio across JAPAC while simultaneously overseeing \$XXM+ cross-practice portfolio as regional Site Lead.
- Led critical engagements for JAPAC strategic accounts including major financial services institutions and consumer electronics manufacturers, ensuring delivery excellence and client success.
- Executed high-impact projects including 12K+ user analytics migrations, first Data & AI Centers of Excellence, Data Monetization Platforms, and petabyte-scale data platform modernizations.
- Partner with C-level stakeholders (CTOs, CDOs) to define data modernization and AI transformation roadmaps, translating technical capabilities into business outcomes.
- Pioneered organization-wide adoption of agentic AI across PSO JAPAC for both customer solutions and internal productivity, including autonomous data engineering agents.

### Technical Innovation & Research (Official IP):

- Research on speculative decoding, custom Triton kernels, and KV-cache compression strategies. Filed Google Technical Disclosure on hybrid compression systems for multi-tenant serving optimization.
- Invented neuro-symbolic framework combining formal verification and reinforcement learning to automate distributed system generation - achieved 274x speedup in synthesis with 60% latency reduction.
- Designed Field-Theoretic Context System modeling context as continuous fields to address long-horizon memory fragmentation in AI agents. Published as Google Technical Disclosure.
- Authored whitepaper introducing Extract, Transform, Load, Contextualize framework adding semantic, relational, and behavioral context to data pipelines for RAG and agentic systems.
- Created adaptive debate-driven decision framework for enterprise multi-agent systems. Published as Google Technical Disclosure.
- Developed industry-agnostic agentic AI system for enterprise-scale trust decisions across Finance, Healthcare, Insurance, Cybersecurity, and Supply Chain. Features APLS (self-learning pattern syn-

thesis) and five-level cascade routing achieving 86% cost reduction with sub-50ms latency. Won Google Cloud PSO Hackathon JAPAC Regionals, qualified for World Finals. Two pending Google Technical Disclosures.

### **Standard Chartered Bank: Principal Engineer - Data & Analytics Transformation** *January 2019 – January 2021*

Led enterprise-wide AI and data platform development serving 11 markets and 1200+ global users, delivering technical excellence while influencing C-suite data strategy.

- Delivered a Self-Service ML Platform that reduced model development time from 6 months to 1 week
- Designed credit risk AI models integrating alternative data sources, improving accuracy by 15%
- Modernized MarTech infrastructure, driving 30% increase in customer acquisition

### **Think Big Analytics (a Teradata company): Principal Data Engineer / Solution Architect** *January 2017 – January 2019*

Architected enterprise-scale data solutions for Fortune 500 clients across APAC, designing scalable platforms with measurable business impact.

- Engineered 5 high-performance data lakes processing 1.2 PB/hour, achieving 20% optimization
- Built real-time fraud detection systems, reducing false positives by 60% and saving \$XM annually
- Designed enterprise architectures supporting global Fortune 500 clients across APAC

### **Various Companies: Software Engineering, Architecture and Technical Consulting Roles** *January 2010 – January 2017*

Progressively advanced through roles in software development, systems integration, and technical consulting within financial services and algorithmic trading domains.

## **Research & Open Source Engineering**

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### **LLM Inference Efficiency Research**

Research implementations addressing the fundamental bottleneck in LLM inference: memory-bandwidth constraints rather than compute limits. Explores acceleration through speculative decoding, custom GPU kernels, and quantization strategies.

GitHub: <https://github.com/bassrehab/speculative-decoding> | GitHub: <https://github.com/bassrehab/triton-kernels>

*Google Technical Disclosure - Pending*

### **AI Metacognition Toolkit**

Activation-level detection of sandbagging, deception, and situational awareness in LLMs. Linear probes achieve 90-96% accuracy across Mistral, Gemma, and Qwen models. Includes steering vectors for run-time behavior control.

PyPI: <https://pypi.org/project/ai-metacognition-toolkit/> | GitHub: <https://github.com/bassrehab/ai-metacognition-toolkit> | Docs: <https://ai-metacognition-toolkit.subhadipmitra.com/> | </blog/2025/detecting-ai-sandbagging/>

### **UPIR - Distributed Systems Synthesis**

Neuro-symbolic framework combining formal verification, program synthesis, and reinforcement learning to automatically generate verified distributed system implementations from specifications.

[https://www.tdcommons.org/dpubs\\_series/8852/](https://www.tdcommons.org/dpubs_series/8852/) | GitHub: <https://github.com/bassrehab/upir>

### **Steering Vectors for Agent Behavior Control**

Runtime control of LLM agent behaviors through activation steering vectors - modifying model outputs at inference time without retraining. Demonstrates more calibrated control than traditional prompting approaches with LangChain integration.

GitHub: <https://github.com/bassrehab/steering-vectors-agents> | </blog/2025/steering-vectors-agent>

## Spark LLM Eval - Distributed Evaluation Framework

Distributed LLM evaluation framework built on Apache Spark for enterprise-scale model assessment. Addresses the gap in evaluating LLMs at scale with statistical rigor, integrating seamlessly with Databricks infrastructure.

GitHub: <https://github.com/bassrehab/spark-llm-eval> | </blog/2025/building-spark-llm-eval/>

## CatchMe - Intelligent Trust Engine

Industry-agnostic agentic AI system for enterprise-scale trust decisions across Finance, Healthcare, Insurance, Cybersecurity, and Supply Chain. Uses adversarial debate protocols (prosecutor/defense/judge) to filter hallucinations and build audit trails for regulated environments.

*Google Technical Disclosures - Pending (APLS & Cascade Routing)*

## Publications & Technical Disclosures

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### UPIR: Automated Synthesis and Verification of Distributed Systems

*Google, Technical Disclosure Commons, November 2025*

[https://www.tdcommons.org/dpubs\\_series/8852/](https://www.tdcommons.org/dpubs_series/8852/)

### ETLC: A Context-First Approach to Data Processing in the Generative AI Era

*Google Cloud, May 2025*

[https://services.google.com/fh/files/blogs/etlc\\_full\\_paper.pdf](https://services.google.com/fh/files/blogs/etlc_full_paper.pdf)

### Field-Theoretic Context System (FTCS)

*Google, Technical Disclosure Commons, May 2025*

[https://www.tdcommons.org/dpubs\\_series/8022/](https://www.tdcommons.org/dpubs_series/8022/)

### ARTEMIS - Adaptive Multi-agent Debate Framework

*Google, Technical Disclosure Commons, January 2025*

[https://www.tdcommons.org/dpubs\\_series/7729/](https://www.tdcommons.org/dpubs_series/7729/)

### Data Monetization Strategy for Enterprises

*BITS Pilani, December 2023*

[https://www.researchgate.net/publication/376557741\\_Data\\_Monetization\\_Strategy\\_for\\_Enterprises](https://www.researchgate.net/publication/376557741_Data_Monetization_Strategy_for_Enterprises)

### OConsent: Open Consent Protocol for Privacy and Consent Management with Blockchain

*BITS Pilani, December 2021*

<https://arxiv.org/abs/2201.01326>

## Education

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<b>MBA, Business Analytics</b>	Birla Institute of Technology and Science, Pilani
<b>MTech, Software Systems</b>	Birla Institute of Technology and Science, Pilani

## Technical Skills

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**Technology Leadership & Strategy:** Enterprise Architecture, Technical Vision & Roadmaps, Digital Transformation, AI & Data Strategy, Cloud Architecture, C-Suite Advisory, Innovation Leadership, Strategic Planning

**Data Engineering & Architecture:** Petabyte-Scale Data Platforms, Data Pipelines, Real-Time Processing, Data Mesh & Fabric, Apache Spark, Apache Hadoop, Apache HBase, Apache Flink, Apache Kafka, Apache Iceberg

**Generative AI & Machine Learning:** Multi-Agent Systems, Large Language Models, RAG Architecture, Vector Databases, PyTorch, LangChain, LangGraph, LlamaIndex, Google ADK, MCP, A2A Protocol, MLflow, LLMOps

**Cloud Platforms & Infrastructure:** Google Cloud Platform, BigQuery, Vertex AI, Dataflow, Cloud Composer, GKE, Terraform, Kubernetes

**Programming & Development:** Python, SQL, Scala, Triton, CUDA, Algorithm Design, Formal Verification, Program Synthesis, Distributed Systems

## Professional Affiliations

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IEEE • ACM • Singapore Computer Society • Royal Institute of Navigation • IIT Madras