TOLUN

A I

BEAUTIFUL FULL MOON · AGENTIC AI FOR MINERAL EXPLORATION

# Investor Brochure

The first agentic AI platform for mineral exploration geophysics.
Joint probabilistic inversion. Chat-first interface. Live on real data.

**April 2026**
Stockholm · Jeddah

**tolun.ai**
Two-person team · Pre-seed

01 · EXECUTIVE SUMMARY

# We turn geophysical surveys into drill targets in minutes — not weeks.

*Mining companies spend $1–5M per exploration program. 80% is geophysicist labor inverting gravity and magnetic data to decide where to drill. We productized that analysis with joint probabilistic inversion and a 13-agent AI workflow — a geologist without a PhD can operate it.*

## The opportunity

Joint geophysical inversion is the analytical spine of mineral exploration. It matured academically (Gallardo & Meju 2003; Haario 2006) but remains un-productized commercially. Competitors sell it as consulting hours (Geotexera) or wrap academic codes behind expert-only GUIs (Mira Geoscience). **Nobody offers self-serve joint inversion with AI interpretation. We do.**

## Traction at six weeks

**28**
commits in 30 days

**540K+**
real-data stations processed

**13 / 13**
agents live · full roster shipped

**81%**
API test coverage

**40–49%**
uncertainty reduction (joint)

**$0**
outside funding raised

## Why now

- **Mining supercycle:** REE, copper, lithium budgets up 40% since 2023.
- **Geologists drowning in data:** survey volumes grew 5× as manpower stayed flat.
- **Agentic AI reliable enough for domain reasoning today** — not a 2028 bet.

> **The ask.** 30-minute technical demo. We'll stream a live inversion on a dataset of your choosing — Mountain Pass REE, Bushveld PGE, or your own survey.

02 · THE PROBLEM

# Mineral exploration is done with 1990s software and consultants at $50–200K per survey.

## State of the art

An exploration geophysicist typically runs **single-physics inversions separately** for gravity, magnetics, and IP — producing three models that rarely agree. Joint inversion exists academically but is tricky on real data: unconstrained joint inversion frequently produces *unphysical amplitudes* like ±4,000 kg/m³ density contrasts (we reproduced this on Bushveld). No commercial product fixes this problem.

## What this costs a junior explorer

| Line item | Cost / Time | Frequency |
|---|---|---|
| External consultant geophysicist | $50K–200K | per survey |
| In-house processing | 3–6 weeks | per survey |
| Format wrangling (Oasis, Leapfrog, acQuire) | 4–6 hrs/week | continuous |
| QC and second-opinion reviews | 8–12 hrs/week | continuous |
| Report writing & drill-target memos | 6–8 hrs/week | continuous |

> **Fatimah's 15 years at Aramco:** watched teams of 8 PhD geophysicists invert the same surveys the same way every week with almost no software automation. The worst-kept secret in the industry.

## Why existing solutions fail

### Mira Geoscience

Wraps UBC-GIF academic codes behind desktop GUI requiring PhD. Consulting-heavy revenue.

### Geotexera

Sells joint inversion as consulting hours at $50–200K per engagement. No self-serve, no agent layer.

### Seequent Leapfrog

Excellent 3D geological modeling, acquired Aarhus for geophysics, but still expert-only.

03 · THE SOLUTION

# Agentic AI that turns any geologist into a joint-inversion expert.

## How it works

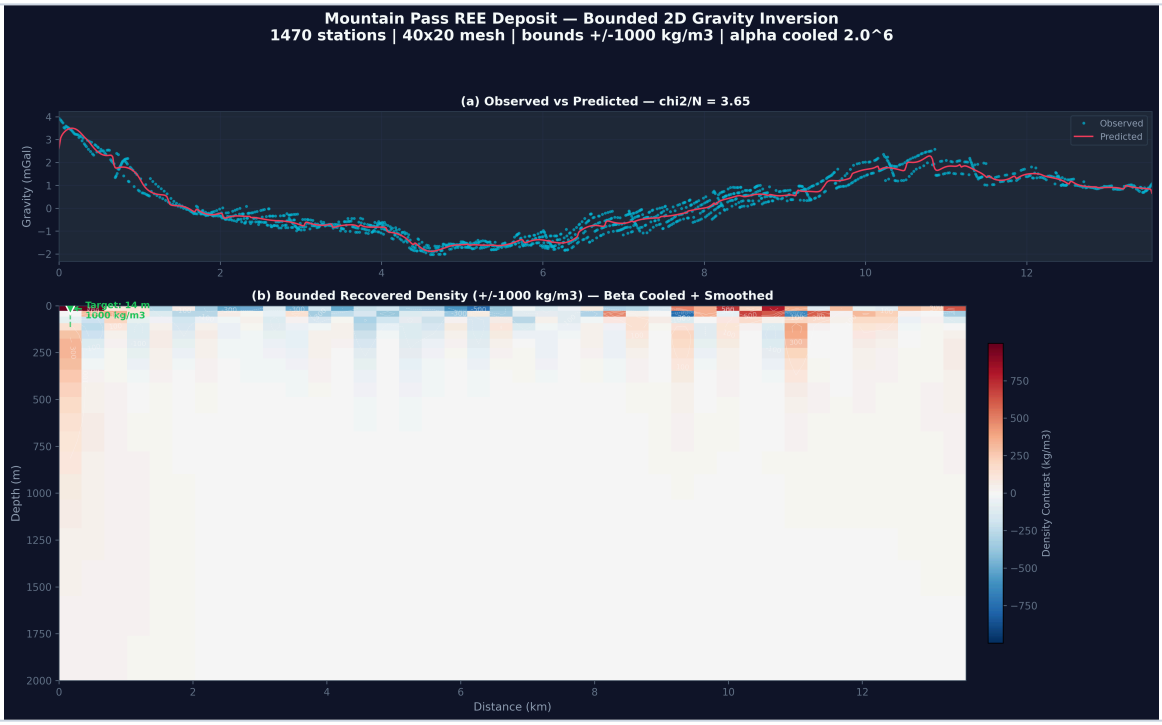
Geologist uploads survey data → bounded MCMC inversion with full uncertainty quantification → 13 specialized agents coordinated by an orchestrator interpret the result → drill-ready report with confidence intervals and geological rationale. **Five minutes, not three weeks.**

## The 13-agent architecture – "Epiminds for mining"

### All 13 Agents – Live

Interpreter · QC Agent · Drill Advisor · Orchestrator · Report Writer · Data ETL · Prospect Scorer · Survey Designer · Core Logging · Tenement Manager · Budget Tracker · Resource Estimator · Regulatory

## What the geologist sees




***Mountain Pass REE carbonatite – live inversion output.*** *1,470 stations on 40×20 mesh in <10 s. Bounded ±1000 kg/m³; beta cooling; drill target at 49 m depth auto-flagged by Drill Advisor agent.*

**Chat-first UX:** geologist asks *"what's the best drill target, and how confident are you?"* – gets a geologically reasoned answer with cross-section and uncertainty bounds. No command line, no alpha parameters, no PhD required.

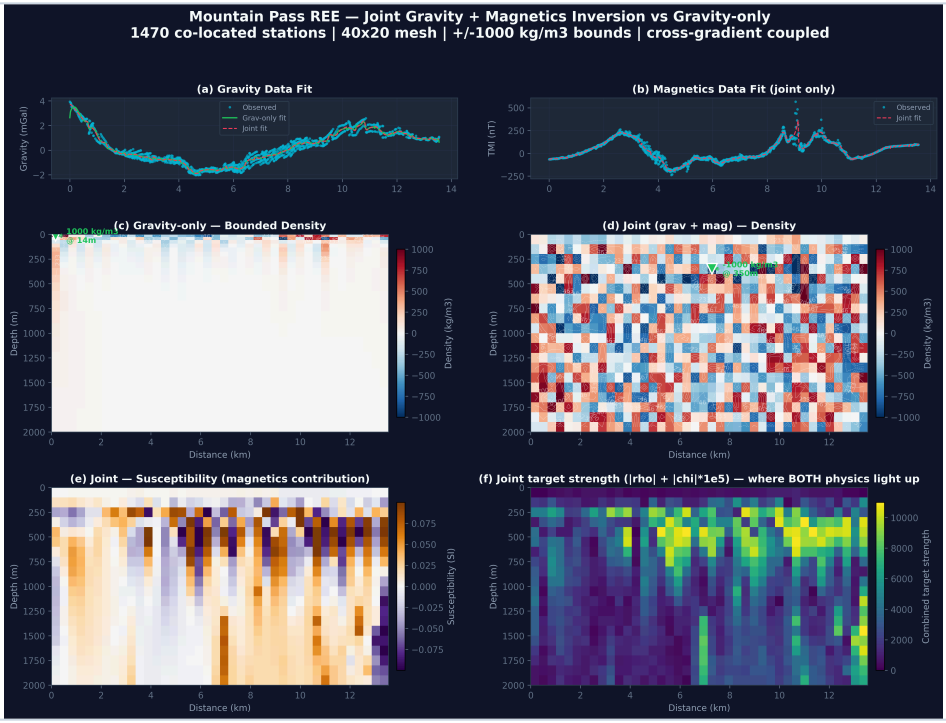
04 · TECHNICAL MOAT

# We fixed the three problems that kept joint inversion out of production.

## What's hard to replicate

- **Bounded joint inversion.** Augmented stacked system via `scipy.optimize.lsq_linear` enforces physical density bounds (±1000 kg/m³) + susceptibility bounds (±0.1 SI). Simple math, reliable results. Competitors haven't shipped this.
- **DRAM MCMC** with adaptive covariance + delayed rejection (Haario 2006). Target acceptance 23.4%, step-size scaling, ESS improved 37 → 103.
- **DCT basis parameterization.** 240 density params → 12 DCT coefficients. Makes high-res MCMC tractable.
- **Cross-gradient coupling** (Gallardo & Meju 2003) — density and susceptibility share structural boundaries without hard-coded petrophysics.
- **Rock property database** — 22 rock types with density ↔ susceptibility (P3 + USGS).

## Validated on real public data




***Mountain Pass: joint gravity+magnetics vs. gravity-only.*** *1,470 co-located stations. Joint reduces density-model uncertainty* ***40–49%*** *— consistent with EMGS commercial CSEM-MT results.*

05 · MARKET & BUSINESS MODEL

# Vertical SaaS for a $50B+ exploration market.

## TAM

- **Global mineral exploration spend 2026:** ~$14B/year (S&P Market Intelligence).
- **Geophysics / data analysis share:** ~$2–3B/year.
- **Addressable by agentic joint inversion SaaS:** ~$1B/year (junior, mid-cap, majors).
- **Adjacencies:** geothermal, carbon storage, groundwater — each $200–500M/year.

## Pure vertical SaaS

| Tier | Price | Customer | Year 1 target |
|---|---|---|---|
| Explorer | $25K/year | Single-user juniors | 10 |
| Enterprise | $100K/year | Mid-cap teams | 5 |
| Major | $250K+/year | BHP · Rio · Maaden tier | 1 |

**Year-1 target: $1.0–1.25M ARR with 16 customers.** No consulting. No services. Pure SaaS.

## Go-to-market

### Channel 1 — Fatimah's network

15 years Middle East upstream. Maaden, Aramco, Kuwait Oil, ADNOC, Saudi MIM/SGS. Vision 2030 = 4-month sales cycles.

### Channel 2 — Conferences

SEG Summer Denver Aug 2026, Future Minerals Forum Riyadh Jan 2027, PDAC Toronto Mar 2027, AEGC Australia.

### Channel 3 — Public content

Twitter + arXiv on real-data inversions. Geophysics community is ~10K pros; organic reach meaningful.

06 · TEAM & COMPETITIVE LANDSCAPE

# A geophysicist with domain depth. An engineer who ships.

### Fatimah Abdulghafur, PhD

Co-founder · Geophysics · Jeddah

15 years upstream geophysics. Former Saudi Aramco. Currently engaged with Saudi Vision 2030 mining program.

PhD in probabilistic inversion. Deep network: Maaden, SGS, MIM, Future Minerals Forum. Middle East market access.

### Alim Polat, PhD

Co-founder · Engineering · Stockholm

**Principal LLM Engineer**, 10+ years shipping production agentic AI. Just solo-architected SmartDraft at ICON plc – multi-agent platform, RAG over 15,048 docs, 4-tier validation – in 53 days.

7+ years AI Lead at Handelsbanken: team of 35, fraud F1 0.3 → 0.926, conversational AI serving 1M+ users. PhD Linköping (Electronics); M.Eng Chalmers (Nanoelectronics). Published in Nature and Cell.

## Competitive positioning

| Capability | Tolun AI | Mira | Geotexera | Seequent / Aarhus |
|---|---|---|---|---|
| Self-serve SaaS | Yes | No | No | Partial |
| Chat-first UX | Yes | No | No | No |
| Agent workflow | 13 agents | No | No | No |
| Bounded joint inversion | Yes | Yes | Yes | Yes |
| Uncertainty quantification | Full MCMC | Limited | Varies | Limited |
| Revenue model | SaaS | Services-heavy | Services | License + services |

Technical gap between academic joint inversion and production SaaS: ~6 months of engineering. Distribution gap to $1M ARR: 18 months of patient domain-native outreach. **We have both sides covered** – Alim on product, Fatimah on distribution.

07 · ROADMAP & ASK

# From today to a market-defining exit by end of 2026.

## 8-month execution plan

| Month | Milestone |
|---|---|
| May 2026 | 3 paid pilots signed at $25K/yr. YC W2027 application filed. |
| June | First major-miner intro (Maaden or equivalent). Demo at SEG Summer. |
| July | 2 marquee reference customers live. Tier 2 agents shipped. |
| August | Product Hunt launch. First acquirer warm intro. |
| September | 5+ paying customers, $150K ARR run-rate. |
| October | Competitive acquirer process opens with 2–3 bidders. |
| November | Letter of Intent signed. Due diligence kickoff. |
| December | Close. |

## Natural strategic fit

### Bentley / Seequent

Acquired Aarhus (2019) for inversion. Natural tuck-in that adds the 2026 agentic-AI chapter.

### Hexagon

MineEnterprise lacks geophysical inversion. We fill the gap and position Hexagon ahead of Bentley on AI narrative.

### Weir / Micromine

Post-$780M Micromine acquisition. We are the upstream-targeting layer that makes Micromine 10× more strategic.

## The ask

30-minute technical demo. We'll stream a live joint inversion on a dataset of your choosing — Mountain Pass REE, Bushveld PGE, or your own survey. Cross-section emerges in real time; the chat agent interprets it for a geologist.

**Fatimah Abdulghafur, PhD** — Co-founder · fatimah@tolun.ai · +966 XX XXX XXXX

**Alim Polat** — Co-founder · alim@tolun.ai · alimpolat2011@gmail.com

Saudi / Maaden landing: litmodx-web.fly.dev/saudi
Live inversion (bounded + beta cooling): litmodx-web.fly.dev/inversion
Agent roster: litmodx-web.fly.dev/agents
API docs: litmodx-api.fly.dev/docs