

PRINCIPAL ENGINEER

Deterministic Governance & Regulatory Codification

Company: Aeonics Labs

Location: United Kingdom — Remote / Hybrid

Department: Research & Engineering

Reporting to: Founder & CEO

Position: Founding Engineering Role

Engagement: Full-time or initial contract with potential for a permanent position

Compensation: Competitive, dependent on experience

ABOUT AEONIC LABS

Aeonics Labs is developing a new approach to governing autonomous artificial intelligence.

As AI systems evolve from providing recommendations to independently executing decisions and performing actions, organisations face a fundamental challenge: how do they ensure that autonomous systems operate within established legal, regulatory and organisational boundaries?

Traditional AI guardrails and security controls cannot independently address every aspect of this challenge.

Aeonics is developing a deterministic behavioural governance architecture designed to bridge this gap.

Our technology comprises three interconnected capabilities:

- **AgentGuard:** Behavioural monitoring and governance for autonomous AI agents.
- **TLAIOR:** A deterministic governance engine designed to translate legal, regulatory and organisational requirements into machine-readable, executable policies.
- **TTN (Trust Network):** A distributed governance and enforcement architecture designed to extend trusted decision-making across technology vendors, organisations and operational environments.

Our underlying principle is straightforward:

AI determines what it wants to do. Aeonics determines what it is allowed to do.

We are looking for an exceptional engineer to help establish the technical foundations of this architecture.

THE OPPORTUNITY

We are seeking a Principal Engineer specialising in knowledge representation, formal methods and policy-as-code to lead the initial development of TLAIOR's regulatory codification capabilities.

This is a foundational engineering position with significant architectural responsibility.

You will develop the mechanisms required to translate complex regulatory and organisational requirements into structured, machine-readable representations and ultimately into deterministic, executable governance rules.

The role combines elements of knowledge engineering, formal logic, compiler design, software architecture and regulatory technology.

You will work directly with the founder and collaborate with legal specialists and existing engineering resources to establish the architecture, technical methodology and initial implementation.

Unlike conventional AI engineering positions, the emphasis is not on developing probabilistic models to interpret or approximate regulatory compliance.

Instead, you will establish the technical foundations for a system that produces consistent, explainable and auditable governance decisions.

The successful candidate will have considerable influence over the technical direction of Aeonic's core intellectual property.

KEY RESPONSIBILITIES

1. Regulatory knowledge representation

Design and develop a canonical representation capable of expressing legal, regulatory and organisational requirements in a structured, machine-readable format.

This includes:

- Modelling obligations, permissions, prohibitions and exceptions.
- Representing regulatory dependencies, conditional requirements and conflicting obligations.
- Establishing relationships between regulatory requirements and organisational policies.
- Supporting jurisdictional and temporal applicability.
- Maintaining traceability to authoritative regulatory sources.

- Evaluating relevant standards and approaches, including LegalRuleML, semantic modelling and established ontology frameworks.

The objective is to establish a reusable representation that can accommodate multiple regulatory frameworks without requiring independent, incompatible implementations.

2. Deterministic policy and rule engineering

Develop the initial policy execution architecture responsible for evaluating actions against codified governance requirements.

Responsibilities include:

- Translating structured regulatory representations into executable rules.
- Evaluating existing policy-as-code technologies, including Open Policy Agent, Rego and Cedar.
- Designing rule composition, precedence, dependencies and conflict-resolution mechanisms.
- Developing structured decision outputs, including supporting evidence and explanations.
- Implementing explicit handling of insufficient information, unresolved legal interpretation and conflicting requirements.
- Establishing comprehensive automated testing and deterministic evaluation methodologies.

The architecture must support consistent decisions when presented with identical inputs, policy versions and contextual information.

3. Regulatory codification pipeline

Establish an initial methodology for converting regulatory requirements into executable governance policies.

This will involve working with specialist legal advisers to define a controlled process covering regulatory interpretation, structured representation, technical implementation, legal validation and deployment.

The resulting architecture should support version control, regulatory updates and auditable change management.

The initial development will focus on selected, clearly defined obligations rather than attempting to automate interpretation of entire regulatory frameworks.

4. Integration with Aeonic's governance architecture

Work with existing engineering resources to establish how the codification engine interacts with AgentGuard and, subsequently, TTN.

Develop the initial interfaces through which autonomous agents and enforcement systems can submit proposed actions for governance evaluation.

Design structured decision responses that can be consumed by downstream enforcement components.

These may include permission, prohibition, conditional approval and escalation decisions.

The design must also distinguish between decisions that can be made automatically and those requiring additional evidence or human authorisation.

5. AI-assisted regulatory interpretation

Contribute to the longer-term architecture for incorporating domain-specific small language models and other AI-assisted components into the regulatory codification pipeline.

The proposed architecture separates probabilistic interpretation from deterministic policy execution.

Explore how specialised models could assist with regulatory classification, information extraction and the identification of relevant obligations while maintaining appropriately controlled, independently validated executable rules.

Experience with LLMs, SLMs, retrieval-augmented generation or structured information extraction would be advantageous.

However, machine learning expertise is secondary to formal knowledge representation and deterministic software engineering.

REQUIRED EXPERIENCE

We recognise that the combination of disciplines required for this position is relatively unusual. Candidates are not expected to have worked extensively with every technology listed.

We are particularly interested in engineers with demonstrable expertise in formal knowledge representation and executable policy systems.

Essential requirements

- Significant software engineering experience, including architecture and development of complex backend systems.
- Strong understanding of formal logic, rule-based reasoning or knowledge representation.
- Experience designing or implementing declarative rule engines, policy evaluation systems or equivalent technologies.
- Strong Python development capabilities.
- Experience developing structured data models, APIs and automated testing frameworks.
- Understanding of deterministic execution, rule precedence and exception handling.
- Ability to translate ambiguous real-world requirements into precise technical specifications.
- Experience independently designing and delivering complex technical projects.

Highly desirable experience

- Knowledge of Open Policy Agent, Rego, Cedar or comparable policy-as-code technologies.
- Experience with knowledge graphs, ontologies, semantic technologies or graph-based reasoning.
- Familiarity with LegalRuleML, OWL, RDF or other formal knowledge representation standards.
- Experience with formal verification, symbolic reasoning, constraint solvers or compiler development.
- Previous involvement in regulatory technology, compliance automation, financial services regulation or enterprise policy management.
- Experience developing distributed decision-making or policy enforcement systems.

Additional advantageous experience

- Understanding of autonomous AI agents, agent orchestration and AI runtime environments.
- Familiarity with LLMs, SLMs and hybrid symbolic/neural architectures.
- Experience with cloud-native architecture, particularly Google Cloud or Microsoft Azure.
- Knowledge of European and UK regulatory environments, including GDPR, DORA and the EU AI Act.
- Experience developing explainable decision-making or auditable software systems.

Direct legal qualifications are not required. Regulatory interpretation will be supported by specialist legal advisers.

INITIAL DEVELOPMENT OBJECTIVES

The first phase of the programme will focus on developing a working regulatory codification prototype.

The successful candidate will be expected to work towards the following objectives during an initial 90-day period.

Days 1–30: Architecture and canonical representation

- Review Aeonics proposed deterministic governance architecture.
- Define the initial regulatory codification methodology.
- Evaluate applicable knowledge representation standards and policy execution technologies.
- Design the first version of the canonical regulatory schema.
- Agree on a limited initial regulatory use case and measurable acceptance criteria.

Days 31–60: Codification and policy execution

- Implement the initial regulatory representation.
- Translate a selected collection of legally reviewed requirements into executable policies.
- Develop the initial deterministic evaluation engine or integrate an appropriate existing technology.
- Establish automated testing, decision traceability and regulatory provenance.
- Demonstrate deterministic evaluation against representative governance scenarios.

Days 61–90: Integration and validation

- Develop an initial integration interface with AgentGuard.
- Demonstrate the end-to-end evaluation of proposed autonomous-agent actions.
- Establish a methodology for testing regulatory correctness with legal specialists.
- Document the architecture, technical decisions and limitations.
- Produce a technical development roadmap for expanding coverage across regulatory frameworks and organisational policies.

The primary deliverable will be a demonstrable governance capability that can evaluate a defined class of autonomous-agent activities against a limited, validated set of executable regulatory requirements.

The prototype should establish a credible foundation for subsequent product development.

WHAT SUCCESS LOOKS LIKE

Success in this role means establishing the technical foundations of a commercially viable deterministic governance engine.

The initial architecture should demonstrate that complex governance requirements can be represented consistently, evaluated deterministically and integrated with autonomous-agent monitoring and enforcement infrastructure.

It must also establish clear boundaries between automated decisions, incomplete evidence and matters requiring human legal interpretation.

Over time, your work will provide the foundation for expanding TLAIOR's regulatory coverage and enabling interoperable governance enforcement through Aeonic's Trust Network.

WHY JOIN AEONIC?

This is an opportunity to contribute to the development of a foundational technology in an emerging area of enterprise AI infrastructure.

You will be joining at a stage where architectural decisions will materially influence the direction of the company.

The position offers direct engagement with the founder, substantial engineering autonomy and the opportunity to establish the initial technical foundations of Aeonic's deterministic governance architecture.

We are particularly interested in individuals who enjoy solving complex problems at the intersection of formal reasoning, software engineering, artificial intelligence and regulatory systems.

To apply

Please provide your CV or professional profile, together with examples of relevant projects involving formal knowledge representation, rule engines, policy-as-code or comparable technical disciplines.

Aeonic Labs

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