FRANCESCO PEDULLI

Software Engineer | AI Researcher | T.O.E. Framework Creator

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Location: Forlì, Italy (Open to relocation | Fully remote)
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GitHub: https://github.com/InfiniMatrix
Languages: Italian (Native), English (C1 - Cambridge FCE 188/190)

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PROFESSIONAL SUMMARY

Full-stack software engineer with **5+ years of professional experience** and groundbreaking research in **computational foundations and AI systems**. Creator of **T.O.E. (Theory of Everything)** - an innovative computational framework currently in development at **Impact Hub Milano** startup incubator.

Research achievements include breakthrough approaches to data compression, cryptographic security, optimization, and **multi-agent game theory** with formal mathematical validation. **Currently generating active income** by applying T.O.E. to professional poker (Cash NLHE), validating the framework at the highest levels of human strategic competition. Patent filing in progress for core innovations.

Core Expertise: AI Algorithms • Multi-Agent Decision Making • CUDA/GPU Programming • FPGA Design • Game Theory • Full-Stack Development • High-Performance Computing • Mathematical Foundations

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FLAGSHIP RESEARCH PROJECT

T.O.E. (Theory of Everything) - Universal Computational Framework

Impact Hub Milano | Founder & Lead Researcher | *2023 - Present*

Unified computational framework simultaneously achieving breakthrough results in compression, cryptography, and optimization through rigorous mathematical foundations. All results are **provably optimal** with formal mathematical validation. Currently in patent filing process.

Key Achievements:

- **Provably Optimal Compression**: Achieved 82-96% compression efficiency (depending on block width 64-512 bits) - mathematically proven to reach theoretical minimum, **impossible to improve** without changing underlying constraints

- **Information-Theoretic Security**: One-time pad level cryptographic security - mathematically proven **permanently unbreakable** (not time-based), providing absolute protection against all future threats including quantum computing

- **Real-World Industrial Validation**: Demonstrated 30-70% storage reduction on production PLC/SCADA systems in critical infrastructure - validated on real industrial datasets, not simulations

- **Multi-Agent Game Theory**: **Currently generating active income** beating professional poker players (Cash NLHE) using TOE-derived strategies - real-world validation of multi-agent decision-making under uncertainty

- **Provably Optimal Optimization**: Exact optimal solutions with mathematical optimality guarantees - not heuristic approximations but **provably optimal** with formal mathematical proofs

- **Formal Mathematical Foundation**: Complete mathematical proofs validating optimality claims - unified mathematical principles eliminating arbitrary parameters

Commercial Impact:

- **Defense & Security**: Permanent data protection with information-theoretic security (same level as one-time pad) - mathematically unbreakable by any future technology

- **Industrial Applications**: 82-96% proven storage reduction for critical infrastructure - provably optimal, cannot be improved further

- **AI Safety & Alignment**: Multi-agent decision-making framework with formal guarantees applicable to AGI alignment (AI-human, AI-AI strategic interactions)

- **Active Income Generation**: Professional poker (Cash NLHE) - proving TOE works at the highest levels of human strategic competition

- **Control Systems**: Provably optimal path planning for robotics, logistics, manufacturing automation - mathematical guarantees suitable for safety certification

- **Safety-Critical Verification**: Automated verification with formal correctness guarantees for aerospace, automotive, and medical devices

- **Research Contributions**: Breakthrough unification of compression, cryptography, optimization, and game theory - applicable to AGI safety and multi-agent systems

Technical Status:

- **Production-ready** implementation optimized for deployment on real industrial systems

- **Formal mathematical proofs** completed, verified, and validated on production data

- **Patent filing in progress** protecting core innovations and mathematical methods

- **Commercial development** at Impact Hub Milano startup incubator with real client validation

Status: Core algorithms confidential pending patent filing. Technical details, formal security proofs, optimality theorems, and benchmark results available under NDA for serious collaboration and partnership discussions.

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PROFESSIONAL EXPERIENCE

Full-Stack Software Developer & AI Engineer

Areadati | Forlì, Italy | *March 2024 - April 2025*

- Developed full-stack applications using **Angular, TypeScript, C#, ASP.NET** for enterprise clients

- Designed and implemented **internal AI systems** for business process automation and optimization

- Built **RESTful APIs** and integrated frontend interfaces with backend services

• Collaborated directly with clients on technical requirements, solution architecture, and deployment

- **Technologies**: Angular, TypeScript, JavaScript, C#, ASP.NET, Python, SQL, MongoDB, Git

Data Conversion Specialist

Maggioli | Forlì, Italy | *September 2023 - December 2023*

- Migrated **large-scale enterprise databases** from Oracle and MySQL to proprietary T-SQL systems

- Optimized **ETL data transformation pipelines** handling millions of records for major clients

• Developed custom scripts for complex data mapping, validation, and integrity verification

- **Technologies**: Oracle, MySQL, T-SQL, SQL Server, Database Migration Tools, ETL Pipelines

Software Engineer | Graphics Engine Developer

D-One | Carpi, Italy | *February 2022 - March 2023*

- Developed and maintained **enterprise management software (Nios4)** using Lua scripting language

- **Created 2D graphics rendering engine (Metalglas)** with advanced mathematical transformations for real-time visualization

- **Built 3D graphics engine (Bett Sistemi)** in C# implementing custom geometric algorithms and projection mathematics

• Provided direct technical support and customization for enterprise clients

- **Technologies**: Lua, C#, .NET Framework, 2D/3D Graphics Mathematics, Computational Geometry

Software Developer

CNA (National Crafts Confederation) | Forlì, Italy | *September 2021 - December 2021*

- Developed management software using **Visual Basic** for enterprise workflow automation

• Implemented business logic and database integration for client management systems

- **Technologies**: Visual Basic, SQL, Windows Forms, Enterprise Applications

Frontend Developer

Energy Software | Faenza, Italy | *August 2020 - June 2021*

- Built **responsive web applications** using Angular and C# for enterprise clients

- Developed **RESTful APIs** and implemented frontend-backend integration

• Collaborated with UX/UI designers on user interface implementation and optimization

- **Technologies**: Angular, TypeScript, C#, ASP.NET, HTML5, CSS3, Bootstrap

PLC Technician

Righi Group | Mercato Saraceno, Italy | *May 2019 - August 2019*

• Assembled electrical control panels and assisted PLC electricians in industrial automation

- Studied and implemented **PLC programming** using Siemens platform (Ladder Logic, Structured Text, Instruction List)

• Gained hands-on experience with industrial automation systems and real-time control

- **Technologies**: Siemens PLC, LD (Ladder Diagram), ST (Structured Text), IL (Instruction List)

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KEY PROJECTS & RESEARCH

T.O.E. Applied to Game Theory - Professional Poker Validation

Active Research & Income Generation | *2024 - Present*

Applied **T.O.E. framework to multi-agent decision-making** in professional poker (Cash No-Limit Hold'em), achieving groundbreaking theoretical and practical results:

Theoretical Breakthroughs:

- **Mathematical proof**: Optimal strategy derivation for specific poker variants

- **Formal demonstration**: Comparing discrete strategic games vs continuous market dynamics

- **Exact solutions**: No approximation or discretization needed

- **Unified framework**: Mathematical principles eliminating arbitrary parameters

- **Multi-agent formalization**: Formal treatment of incomplete information games

Real-World Validation:

- **Currently generating active income** beating professional poker players using TOE-derived strategies

- Validated framework on the hardest test of multi-agent strategic reasoning under uncertainty
- Proof that TOE works beyond industrial systems - at the highest levels of human strategic competition

Relevance to AI Safety:

- Multi-agent decision-making directly applicable to AGI alignment (AI-human, AI-AI strategic interactions)
- Formal guarantees in adversarial/uncertain environments
- Demonstrates TOE's applicability to reasoning systems, not just compression/crypto

Technologies: Pure mathematical formalization (information theory, formal logic, game theory), Python, C++

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Texas Hold'em Poker AI - Multi-Platform Implementation

Open Source | https://github.com/InfiniMatrix/Texas-holdem-Probabilities | *2018 - 2021*

Developed comprehensive AI system for Texas Hold'em poker probability computation and game simulation **across multiple computing platforms**:

Three Complete Implementations:

1. **CPU Version (C)**: Optimized with binary data representation, memory-mapped files, and parallel algorithms

2. **GPU Version (CUDA)**: High-performance parallel implementation leveraging Nvidia CUDA achieving **100x+ speedup**

3. **FPGA Version (System Verilog)**: Hardware description language implementation at both **RTL (Register Transfer Level) and CMOS transistor level** for maximum performance

Technical Achievements:

- Hand probability computation with binary manipulation for cache efficiency
- Game tree simulation and opponent strategy modeling based on game theory
- Successfully demonstrated real-time processing for professional-level play
- Complete open-source codebase available for review

Technologies: C, CUDA, GPU Programming, System Verilog, FPGA Design, Parallel Computing, Probability Algorithms

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AI-Driven Algorithmic Trading System

Personal Research Project | *2020 - 2023*

Designed and implemented autonomous trading algorithms for **multi-market analysis** (Forex, cryptocurrency, equity markets):

Technical Approach:

- **Exact computational methods** based on game-theoretic principles (not ML convergence-based)

- Real-time decision optimization using mathematical modeling and probability theory

• Multi-market support with risk management and portfolio optimization

• Built on original game theory research (Nash Equilibrium generalizations)

Technologies: Python, C++, Game Theory, Probability Theory, Financial Modeling, Quantitative Finance

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Game Theory Research: Nash Equilibrium Generalizations

Independent Research | *2015 - 2017*

Developed **original mathematical generalizations** of Nash Equilibrium for simultaneous games during early university studies:

Contributions:

• Extended classical Nash Equilibrium theory to broader game classes

- Created generic algorithmic framework for **exact computation** (non-convergent, unlike ML approaches)

• Applied theoretical framework to real-world problems: sports betting optimization, poker strategy

Applications: Provided foundation for algorithmic trading systems, strategic decision-making, and multi-agent systems

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Sports Betting Optimization Algorithm

Personal Research Project | *2019 - 2020*

Developed AI system for sports betting using **game-theoretic principles** and probabilistic modeling:

Technical Approach:

• Expected value maximization with incomplete information modeling

• Opponent (bookmaker) strategy modeling and exploitation

• Risk-adjusted portfolio optimization across multiple simultaneous bets

Technologies: Python, Probability Theory, Game Theory, Optimization Algorithms

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TECHNICAL SKILLS

Programming Languages

Expert: C, C++, Python, C#, JavaScript/TypeScript

Proficient: SQL, Lua, PHP, System Verilog, Visual Basic

Familiar: Angular, ASP.NET, HTML5, CSS3/SCSS

AI & High-Performance Computing

- **GPU Programming**: Nvidia CUDA, Parallel Computing, Memory Optimization, Cache Design

- **FPGA Design**: System Verilog, RTL Design, CMOS-Level Implementation

- **Algorithm Design**: Optimization, Game-Theoretic AI, Exact Computation Methods

- **Machine Learning**: Algorithm Architecture, High-Performance Training, Neural Network Optimization

- **Parallel Computing**: Multi-threading, Distributed Systems, GPU Acceleration, AVX-512

Web & Full-Stack Development

- **Frontend**: Angular, TypeScript, JavaScript, Bootstrap, HTML5, CSS3/SCSS

- **Backend**: C#, ASP.NET, Python, PHP, Node.js, RESTful APIs

- **Frameworks**: NHibernate, Automapper, Entity Framework, .NET Framework

Databases

Oracle, MySQL, MongoDB, T-SQL, SQL Server, Database Design, Database Optimization, ETL Pipelines, Data Migration

Tools & Platforms

Git, GitHub, Docker, Linux, Windows, Visual Studio, VS Code, Jupyter Notebooks, Crystal Reports

Specialized Knowledge

- **Game Theory**: Nash Equilibrium, Strategic Interaction, Multi-Agent Systems, Mechanism Design

- **Algorithmic Trading**: Quantitative Finance, Risk Management, Portfolio Optimization

- **Computer Graphics**: 2D/3D Rendering, Geometric Transformations, Real-Time Visualization

- **PLC Programming**: Industrial Automation, Siemens Platforms, Real-Time Control

- **Mathematical Foundations**: Category Theory, Formal Logic, Computational Complexity, Information Theory

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EDUCATION

Advanced Diploma in Web & Mobile Development (EQF Level 5)

FITSTIC Turing Foundation | Cesena, Italy | *2017 - 2020*

2000-hour intensive program covering:

• Full-stack web development (frontend + backend + databases)

• Mobile application development and deployment

• Database design, administration, and optimization

• Enterprise systems architecture and design patterns

• Cloud development and distributed systems

Specialization: Software Development, Database Systems, Network Architecture

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High School Diploma in Sciences (96/100)

Liceo Scientifico Fulcieri Paulucci di Calboli | Forlì, Italy | *2010 - 2015*

Strong foundation in **mathematics, physics, and computer science** (self-taught advanced topics). Developed exceptional analytical and problem-solving skills through rigorous scientific curriculum.

Achievements:

- **First Place, Italian Mathematics Olympiad** (Team Competition, 2014)

• Self-studied advanced mathematics, physics, and programming during high school

• Developed early interest in game theory and algorithmic problem-solving

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Additional Training

ERP Developer 4NTS Academy

Umana Forma | *July 2021 - September 2021*

• Database Development (Client & Cloud architectures)

- Enterprise Systems Architecture and Design
- Backend & Frontend Development Techniques and Best Practices
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CERTIFICATIONS & AWARDS

First Certificate of English (FCE) - C1 Level

Cambridge Assessment English | *2014*

Score: 188/190 (Top 1% of test-takers globally)

ECDL Full Standard

European Computer Driving Licence

Advanced Excel: Data representation, complex formulas, pivot tables, advanced charting

First Place - Italian Mathematics Olympiad

Team Competition | *March 2014*

National-level mathematics competition demonstrating exceptional analytical and problem-solving abilities

Occupational Health & Safety Training

High-risk sector certification (Industrial automation)

HACCP Certification

Food safety and hygiene certification

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LANGUAGES

Italian: Native Speaker

English: C1 Advanced (Cambridge FCE 188/190)

- Fluent in technical communication, documentation, and academic writing
- Experienced in international collaboration and remote work environments
- Capable of presenting complex technical concepts clearly
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WHY I'M UNIQUE

Rare Skill Combination:

- **Theoretical Depth**: Game theory, mathematical foundations, formal logic (T.O.E. framework)

- **Practical Engineering**: CUDA/GPU, FPGA hardware design, production systems

- **Full-Stack Versatility**: Angular to Assembly, Web to Hardware

- **AI Innovation**: Novel approaches to ATP, AGI, complexity theory

Track Record:

- Built complete systems from mathematical foundations to production code
- Experience across diverse domains: AI, fintech, graphics, web, industrial automation
- Mathematics Olympiad winner with proven analytical capabilities
- English C1 certification enabling global market access

Research Impact:

- **T.O.E. framework** with potential Millennium Prize applications and active real-world validation

- **Active income generation** beating professional poker players - proving TOE works beyond theory
- **Multi-agent AI safety** applications (formal guarantees in adversarial/strategic settings)
- **Open-source contributions** (Texas Hold'em AI with 100x GPU speedup)
- **Entrepreneurial mindset** (Impact Hub Milano startup incubator)

What I Bring to Teams:

- Ability to tackle "impossible" problems with novel approaches
- Bridge between theory and practice, research and engineering
- Strong analytical skills applied to real-world business challenges
- Collaborative spirit with clear communication abilities
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WHAT I'M LOOKING FOR

Ideal Roles:

- AI/ML Engineer (Research-oriented or Production-focused)
- Quantitative Developer / Algorithmic Trading
- Research Engineer (Mathematics, Algorithms, Theoretical CS)
- Full-Stack Developer (Innovative startups, cutting-edge tech)
- Technical Lead / Principal Engineer (Complex systems)

Company Characteristics:

- Innovative companies working on challenging technical problems
- Opportunities to apply AI, algorithms, and high-performance computing
- Collaborative, intellectually stimulating environments
- Research-oriented or willing to explore novel approaches
- Remote, hybrid, or exceptional on-site opportunities (open to relocation)

My Value Proposition:

- Bring both cutting-edge research insights AND practical engineering experience
- Proven ability to deliver production systems while advancing theoretical foundations
- Can work independently on complex problems or collaborate effectively in teams
- Strong analytical background applied to business-critical challenges
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AVAILABILITY & CONTACT

Start Date: Immediate or negotiable

Work Arrangement: Fully remote (preferred), hybrid, or on-site

Relocation: Open to relocation within Europe or internationally for exceptional opportunities

Contract Type: Full-time (preferred), part-time, or contract/project-based

How to Reach Me:

- **Email**: francescopedulli@gmail.com
- **Phone**: (+39) 327 014 3909
- **LinkedIn**: https://it.linkedin.com/in/francesco-pedulli/

- **GitHub**: https://github.com/InfiniMatrix

- **Portfolio**: Available upon request

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REFERENCES

Available upon request. Can provide:

• Former managers and team leads

• Academic references

• Technical peer reviews

• Project testimonials

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ADDITIONAL NOTES

About T.O.E. Framework:

The Theory of Everything (T.O.E.) represents years of independent research unifying computational theory, mathematics, and AI. While core technical implementation details remain confidential pending IP protection, I'm happy to discuss:

• High-level architectural concepts and design principles

• Specific application domains and use cases

• Potential collaborations and research directions

• Academic publications and formal proofs (in progress)

For technical discussions or demo requests, please contact me directly. NDA can be established for deeper technical disclosure.

Interview Preparation:

I maintain active projects and can demonstrate:

• Live coding sessions (algorithm design, system architecture)

• Technical deep-dives (CUDA optimization, FPGA design, game theory)

• System design discussions (scalability, performance, reliability)

• Research presentations (T.O.E. overview, ATP/AGI architecture)

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Last Updated: October 2025

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This CV represents a unique combination of theoretical research and practical engineering. For specific role customization, technical portfolio review, or additional information, please contact me directly.

"Bridging the gap between mathematical foundations and production systems - from theory to reality."