5SKILL
SOLUTIONS

Master’s Thesis (TFM) Opportunities

UPC Industrial Day

THREE PROJECTS

01 **AI Production Planning**
Optimisation · finite-capacity scheduling

02 **ERP AI Agents**
LLMs · RAG · secure automation

03 **IT/OT Cybersecurity**
Risk assessment · threat monitoring

CONTACT
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Who we are

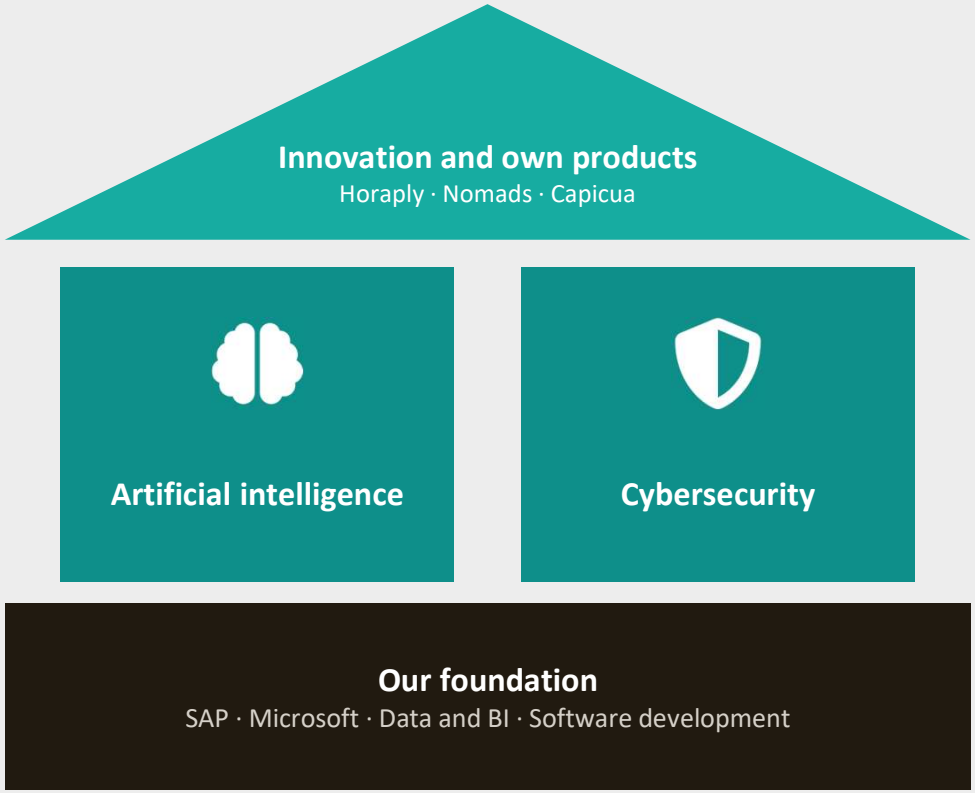
A technology consultancy that transforms companies, and builds its own products

MISSION

We transform companies so they work better, decide better and can grow, and we turn business opportunities into scalable products and businesses.

VISION

To be a reference in transforming companies through artificial intelligence and cybersecurity, while creating and scaling our own businesses.



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Where your thesis fits in our plan

We are growing through AI, cybersecurity and an AI-native way of working: each TFM sits on one of those bets

AI in industrial operations

Apply AI and optimisation where plants feel it most: planning and capacity.

Project 1 · AI Production Planning

AI connected to the heart of the company

Our strongest edge: AI that works on top of SAP and other ERPs, securely.

Project 2 · ERP AI Agents

Cybersecurity with method and order

Protect connected factories with clear risk methods and monitoring.

Project 3 · IT/OT Cybersecurity

HOW WE WORK

5Core method
One delivery method across every project

20% for innovation
Part of everyone's time goes to new ideas

Tech pearls
Weekly 30-minute peer learning sessions

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PROJECT 1 · THE CHALLENGE

AI-Driven Production Planning

and Finite-Capacity Scheduling

Factories must meet delivery dates with limited machines, people and materials, and plans break whenever something changes.

The idea: combine AI and operations research to plan better.

- **Limited machines**
- **Limited people**
- **Limited materials**
- **Fixed delivery dates**

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PROJECT 1
AI Production Planning

What you will build

A finite-capacity scheduling engine combining AI and operations research

Constraints it must handle

- Machine capacity
- Workforce availability
- Operation sequences
- Material constraints
- Setup times
- Delivery deadlines

Three approaches to compare

Constraint programming
Exact search over rules and precedences

Mathematical optimisation
MILP models with provable bounds

AI-assisted heuristics
Fast dispatching that reacts to change

Planners stay in control: simulate breakdowns, rush orders or late materials, adjust priorities and replan.

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The thesis in practice

Open questions your TFM can answer, and who it suits

Research questions

Q1 When does constraint programming beat MILP or heuristics on realistic shop-floor problems?

Q2 How quickly can the engine replan after a disruption without destabilising the plan?

Q3 Can AI deliver near-optimal schedules in seconds where exact methods need minutes?

Ideal profile

- ✓ Industrial, computer or data engineering
- ✓ Comfortable with Python
- ✓ Basics of optimisation or OR

Indicative stack *open to your proposal*

Python · OR-Tools CP-SAT · Pyomo · HiGHS / Gurobi · pandas · Streamlit

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Deliverables and evaluation

What you hand in, and how we will know it works

Working prototype

Builds feasible plans and replans when conditions change.

Documented optimisation model

Variables, constraints and objectives, fully written up.

Simple planner interface

Inspect the schedule, simulate disruptions, reprioritise.

KPIs against a baseline *e.g. the current plan*

- **Delivery delays** ↓
- **Resource utilisation** ↑
- **Changeover times** ↓

ERP / MES integration

How the engine would plug into ERP and MES: what data it reads and how plans return to the shop floor.

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PROJECT 2 · THE CHALLENGE

Industrial ERP AI Agents

Secure Automation and Decision Support

Teams lose time looking for information and doing routine tasks in ERP systems such as SAP.

Can an AI assistant help while staying secure and explainable?

- Searching for data
- Routine tasks
- Must stay secure
- Must be explainable

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PROJECT 2
ERP AI Agents

What you will build

LLMs + RAG + controlled API integrations, on synthetic or anonymised ERP data

Use cases

Purchase-order status
"Has the steel order shipped yet?"

Production delays
"Which orders are late, and why?"

Inventory shortages
"What will run short next week?"

Operational summaries
"Summarise yesterday's production."

Secure and explainable

Role-based access
Only what the user's ERP role allows

Traceability
Every answer and action logged

Human approval
Sign-off for sensitive actions

Answer safeguards
Grounded, cited, declines when unsure

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PROJECT 2
ERP AI Agents

The thesis in practice

Open questions your TFM can answer, and who it suits

Research questions

Q1 How accurate are RAG-based answers on structured ERP data compared with direct queries?

Q2 Which guardrails cut wrong or unsafe answers without hurting usability?

Q3 Where should the line for human approval sit when an agent acts on an ERP?

Ideal profile

- ✓ Computer science, AI or data science
- ✓ Python and REST APIs
- ✓ SAP knowledge a plus, not required

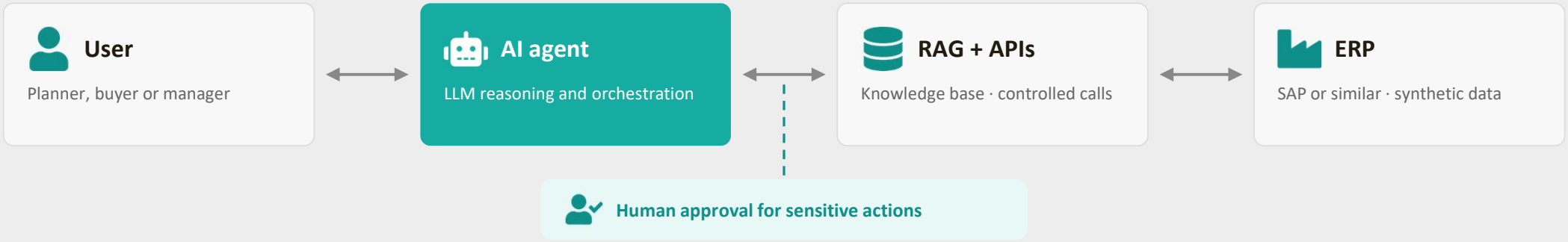
Indicative stack *open to your proposal*

Python · LangGraph · Vector DB · LLM API · Mock ERP APIs · Eval harness

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Deliverables and evaluation

The agent never touches the ERP without controls in between



Deliverables

- Agent prototype
- Architecture documentation
- Industrial test scenarios

Evaluation

- Answer accuracy
- Task reliability
- Security
- Ease of use

Path to pilot

What it takes to go from proof of concept to a supervised pilot: data access, governance and integration.

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PROJECT 3 · THE CHALLENGE

Industrial IT/OT Cybersecurity

Risk Assessment and Threat Monitoring

Smart factories connect business IT systems with operational technology, equipment and industrial networks.

Every new connection widens the attack surface.

Business IT	OT and equipment	Industrial networks	Attack surface

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PROJECT 3
IT/OT Cybersecurity

What you will build

From an asset map to a working threat-monitoring demonstrator

1

Map the landscape

IT and OT assets, data flows and attack surfaces.

2

Assess the risk

A repeatable method to rate threats by likelihood and impact.

3

Build the lab demonstrator

Logs, network telemetry and SIEM-style alert correlation.

4

Anomaly detection

OPTIONAL

ML on public or synthetic industrial datasets.

Rules of engagement

- All testing authorised
- Isolated lab environment
- Non-disruptive by design
- No access to production systems

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PROJECT 3
IT/OT Cybersecurity

The thesis in practice

Open questions your TFM can answer, and who it suits

Research questions

Q1 Which IT/OT risks matter most in a mid-size factory, and how should they be ranked?

Q2 How can alerts from IT and OT sources be correlated to cut false positives?

Q3 Which controls give the most risk reduction at an acceptable operational cost?

Ideal profile

- ✓ Cybersecurity, telecom or computer eng.
- ✓ Networking and Linux basics
- ✓ Curious about Modbus, OPC UA

Indicative stack *open to your proposal*

Wazuh / Elastic · Zeek · Suricata · PLC simulators · Python · ICS datasets

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Deliverables and evaluation

What you hand in, and how we judge whether the controls are worth it

Reference security architecture

Zones and controls separating business IT from OT.

Prioritised risk register

Risks ranked, each with a mitigation.

Monitoring proof of concept

Collects events, correlates alerts, flags what matters.

Evaluation

- **Alert relevance**
- **False positives**
- **Operational implications**

Interested in one of the three projects? Pablo Velasco Bautista · pvelasco@5skill.com