

Python for AI

Applied NLP & Knowledge Systems: RAG, Semantic AI and Secure Deployment

LevelUp Economy and Istidama Consulting are pleased to present the 16-week integrated training program customized to prepare learners with the technical, English language, and professional skills needed for today's AI-driven workplace.

The program brings together three strands:

- Technical Track (16 weeks, ~160 hrs): From Python and data foundations through NLP, RAG systems, Knowledge Graphs, and deployment, leading to a Capstone project.
- English for AI (16 weeks, ~80 hrs): Professional English anchored in AI, with authentic readings, technical reporting, and oral presentations.
- Soft Skills Program (5 weeks, 20 hrs): Focused workshops on communication, teamwork, problem-solving, and workplace readiness.

The delivery model is hybrid, combining synchronous and asynchronous online components with weekly in-person labs, workshops, and project sessions.

Program Overview

The program is structured to balance challenge with support. Learner progress will be monitored throughout, with weekly deliverables, project milestones, and formative assessments built into each track. Learners who need additional help will receive targeted support, and they will also be given the agency to seek help on their own through structured TA "office hours". These office hours give students the chance to clarify technical or language challenges, get feedback on assignments, or ask for guidance on projects — ensuring no one is left behind while reinforcing responsibility for their own learning.

Distinguishing Features

- **Automated Pre-Testing:** All learners complete proctored entry tests in English and Python to establish baseline skills.
- **Weekly formative exercises** to ensure practical application of skills covered under each topic.
- **Authentic Resources:** Course content draws on real AI texts and media: Demystifying Artificial Intelligence, Interpretable Machine Learning, articles from WIRED and MIT Technology Review, and multimedia such as Talks at Google with Dr. Omar Hatamleh (NASA).
- **Capstone Project:** Learners design, build, and present an end-to-end AI system in teams. Example themes include:
 - Defense: RAG-powered Q&A over synthetic defense policy documents.
 - Infrastructure: KG-enhanced entity linking for smart city data (traffic, outages).
 - Healthcare: Retrieval and summarization across multilingual health texts (Arabic/English).
 - Education: Semantic search across course materials, linked to curriculum ontologies. (Teams may also propose their own ideas.)
- **Hybrid Delivery:** A blend of live instruction, self-paced practice, offline labs, and project work.
- **Competency-Based Outcomes:** Each module ends with a deliverable (repo, report, presentation) and a defined skills outcome.

Design Principles

- **Integrated Pathways:** Technical, English, and Soft Skills run in parallel, reinforcing one another through shared assignments and project work.
- **Task- and Project-Based:** Every module closes with an applied deliverable — from GitHub repos to essays to presentations.
- **Scaffolded Progression:** Learners move step by step from foundations to advanced deployment, with English and soft skills layered throughout.
- **Active Practice:** Emphasis on group work, role plays, peer feedback, and workplace-like scenarios.
- **Capstone-Driven:** All strands converge in the Capstone, where learners demonstrate the full stack of skills.

Integrated Soft Skills Competencies

In addition to the training workshops, soft skills are embedded in daily practice. Learners apply professional behaviors as part of their technical and English training:

- **Critical Thinking & Problem-Solving:** debugging, evaluating trade-offs between AI models, and analyzing AI readings to form evidence-based arguments.
- **Professional Communication:** writing emails, reports, and presentations using correct technical and business language.
- **Collaboration & Teamwork:** working in pairs and groups, using shared GitHub workflows and presentations that mimic professional teams.
- **Time & Task Management:** meeting assignment deadlines, managing multi-track deliverables, and working in sprint-like cycles.
- **Professional & Ethical Conduct:** observing etiquette in shared code repos, citing sources properly, and practicing responsible reporting.
- **Leadership & Initiative:** rotating roles (Project Manager, Documentation Lead, QA) and leading discussions or presentations.
- **Adaptability & Resilience:** handling shifting project requirements, errors, or Q&A under pressure.
- **Digital Professionalism:** building a GitHub portfolio with clean documentation, writing LinkedIn summaries in professional English, and practicing digital communication etiquette.

Technical Skills Outline

| Week | Content | Deliverables | Skills Outcome |
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| 0–00 | Pre-Work: Python Refresh & Setup <ul style="list-style-type: none"> - Python fundamentals (syntax, functions, OOP) - GitHub, CLI, Jupyter - Conda/venv setup, IDE familiarity | Baseline Python fluency validated via exercises & setup confirmation | Python, GitHub workflows, and environments |
| 1 | Module 1: Dev Environment & Collaboration <ul style="list-style-type: none"> - Git & branching workflows - Conda/venv environments; Docker intro - JupyterLab vs IDE workflows - Agentic IDEs & coding with AI | Collaborative repo with working envs + branching practice | Reproducible Python envs; Git branching; IDE/Jupyter proficiency; AI-assisted coding |
| 2 | Module 2: Programming for AI & DS <ul style="list-style-type: none"> - NumPy, Pandas, Matplotlib - Modular coding, reproducibility - Unit testing basics - PyTorch/TensorFlow essentials | Reusable data pipeline + reproducible notebook | Proficiency in data analysis & visualization; modular code practices; ML model basics |
| 3 | Module 3: Relational Databases & SQL <ul style="list-style-type: none"> - Data modeling (tables, keys) - SQL queries (JOINs, CTEs, windows) - Postgres (Docker) & SQLite - ETL → Pandas; schema/data checks | SQL analytics pack + Python ETL script | Database modeling & querying; ETL pipelines; integrating SQL with Python |
| 4 | Module 4: Descriptive Analytics & Visualization <ul style="list-style-type: none"> - EDA (distributions, correlations) - Hypothesis testing - KPI design, cohorting - Matplotlib/Seaborn/Plotly viz | Descriptive analytics report with KPIs + visualizations | EDA proficiency; statistical reasoning; data storytelling with visualizations |
| 5–6 | Module 5: Predictive Modeling Foundations <ul style="list-style-type: none"> - Train/val/test splits, CV - Logistic/linear regression, regularization - Trees, forests - Handle imbalance; calibrated probs - Precision, recall, PR-AUC, calibration | Model comparison table + recommendation memo | Evaluate ML models; interpret metrics; reproducible workflows; communicate trade-offs |

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| 7–8 | Module 6: NLP Foundations <ul style="list-style-type: none"> - Text preprocessing, multilingual handling - spaCy + HF tokenization, NER - Embeddings: word2vec, fastText, GloVe → BERT/SBERT | NER + embeddings pipeline on domain data | NLP preprocessing; embedding use/comparison; applied NER pipeline |
| 9–10 | Module 7: Advanced NLP Tasks <ul style="list-style-type: none"> - Transformer architectures - Fine-tuning BERT/RoBERTa/GPT - Tasks: classification, sentiment, QA, summarization, ASR | Fine-tuned model + evaluation report | Advanced NLP pipelines; fine-tuning transformers; task-specific evaluation |
| 11 | Module 8: RAG Systems & Vector Retrieval <ul style="list-style-type: none"> - Dense vs sparse retrieval (BM25, DPR, hybrid) - Weaviate setup + indexing - RAG integration with LLMs | RAG mini-service (retriever + generator) with retriever unit test | Design retrieval systems; integrate retrievers with generators; run vector DBs |
| 12–13 | Module 9: Knowledge Graphs & Semantic Web <ul style="list-style-type: none"> - KG basics, entity linking, completion - Graph Neural Networks intro - Neural-symbolic integration - Triple stores (Blazegraph, Fuseki) - SPARQL, ontology disambiguation | KG semantic search demo (entity linking + reasoning + SPARQL) | Build/query KGs; integrate NLP outputs; neural-symbolic reasoning |
| 14 | Module 10: Deployment & Scaling I <ul style="list-style-type: none"> - FastAPI backend wrapping NLP+RAG+KG - Next.js lightweight frontend - Dockerize microservices | Dockerized services running locally | Deploy backend APIs; containerize services; connect frontend/backend |
| 15 | Module 11: Deployment & Scaling II <ul style="list-style-type: none"> - Orchestrate with Docker Compose - Monitoring: latency, error, answer quality - Automated evaluation scripts | Multi-service stack with monitoring + auto eval | Manage multi-service deployments; monitor/evaluate AI systems |
| 16 | Module 12: Capstone Kickoff <ul style="list-style-type: none"> - Problem framing & KPIs - Pipeline planning (NLP/RAG/KG) - Risk analysis; success criteria - Repo setup (README, env, data, roles) | Scoped capstone plan + team repo initialized | Frame technical projects; plan pipelines; collaborative repo setup |
| Capstone | Capstone Project Build & Present <ul style="list-style-type: none"> - End-to-end pipeline (NLP → RAG → KG → API) | Final integrated system + deployment + monitoring + executive briefing | Deliver integrated AI system; deploy & |

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| | <ul style="list-style-type: none">- Multi-service Compose deployment- Monitoring dashboard/scripts- Executive briefing deck | | monitor; communicate technical findings |
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English Language Skills Outline

| Week | Content | Deliverables | Skills Outcomes |
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| 0 | Prep & Orientation | Diagnostic writing sample; discussion: “What is AI?” | Establish baseline writing & speaking proficiency; understand course structure |
| 1 | Academic & Professional Writing Basics | Short personal bio (written & oral) | Write structured paragraphs; practice introductions |
| 2 | Summarizing & Critical Reading | Summary of short AI text (e.g., Demystifying AI, Ch.1) | Identify main ideas & supporting details; concisely summarize |
| 3 | Public Speaking Foundations | 2-min presentation: explain an AI concept from reading | Present technical ideas clearly; practice body language |
| 4 | Formal Communication I | Formal email draft (e.g., inquiry to a researcher/company) | Write clear, polite, professional emails |
| 5 | Professional Writing I | Draft CV | Produce a professional CV tailored for AI/tech roles |
| 6 | Professional Writing II | Draft Cover Letter | Write persuasive cover letters linking skills to AI opportunities |
| 7 | Debate Skills I | Debate: “Should AI be trusted in medicine?” (based on WIRED article) | Express and defend opinions using evidence |
| 8 | Midterm Assessment | Written essay + short oral presentation (on AI topic from readings) | Demonstrate integrated writing & speaking skills |
| 9 | Interview Skills I | Mock interview role play (AI job scenario) | Practice professional Q&A with technical vocabulary |
| 10 | Interview Skills II | Follow-up email after interview | Write concise, professional follow-up communication |

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| I1 | Reading & Discussion I | Group presentation on Demystifying AI (Ch.3: AI applications) | Analyze technical reading; present key ideas |
| I2 | Technical Reporting I | Short technical report (500 words) on Interpretable Machine Learning (Molnar – “Why interpretability matters”) | Structure technical reports; practice objective style |
| I3 | Reading & Discussion II | Group presentation on MIT Tech Review article (AI + education/governance) | Deliver structured presentation; expand thematic vocabulary |
| I4 | Media Analysis | Listening: Dr. Omar Hatamleh Talks at Google – “A Future with Innovation” + written reflection | Take structured notes; analyze spoken English in technical talks |
| I5 | Capstone Prep | Draft final essay/report (1,000 words) + rehearse presentation | Apply academic & technical English conventions |
| I6 | Capstone | Integrated with technical component | |

Soft Skills Outline

| Week | Content | Deliverables | Skills Outcomes |
|------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------|-----------------------------------------------------------------------|
| 1 | Professional Communication & Teamwork <ul style="list-style-type: none"> • Active listening, clear communication • Team roles & collaboration styles • Giving & receiving feedback | Embedded assignments throughout projects and capstone | Practice professional communication; collaborate effectively in teams |
| 2 | Presentation & Storytelling Skills <ul style="list-style-type: none"> • Structuring presentations • Storytelling for technical/non-technical audiences • Confidence & body language | 3-min individual presentation (AI/tech topic) | Deliver structured, confident presentations adapted to audience |
| 3 | Time & Productivity Management <ul style="list-style-type: none"> • Prioritization (Eisenhower Matrix, Pomodoro Technique) • Managing workload in projects • Digital productivity tools | Embedded assignments throughout projects and capstone Personal productivity plan (1-page) | Apply time-management techniques; use tools to stay organized |
| 4 | Problem-Solving & Critical Thinking <ul style="list-style-type: none"> • Structured problem-solving (IDEAL, 5 Whys) • Creativity in solutions • Decision-making under constraints | Embedded assignments throughout projects and capstone | Apply critical thinking to workplace-like problems; justify solutions |

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| 5 | <p>Professional Readiness:</p> <p>Preparing a LinkedIn profile</p> <p>Interviewing Skills</p> | <p>Dedicated drills and Mock-up interviews (role-play)</p> | <p>Develop the ability to present oneself professionally during interviews and online.</p> |
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