AI/LLM Learning Plan for Finance & Consultancy Roles

Overview & Timeline

Duration: 3-4 months intensive learning + job search **Daily Commitment**: 5-6 hours learning + 1-2 hours networking/applications **Target**: Data Scientist roles with AI/LLM focus in finance/fintech/consultancy

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Phase 1: Deep LLM Foundations (Weeks 1-4)

Week 1-2: Advanced Transformer Architecture & Mathematics

Learning Objectives:

- Master transformer architecture from first principles
- Understand attention mechanisms mathematically
- Grasp positional encodings, layer normalization, and residual connections

Resources:

1. **Theory**:
   - "Attention Is All You Need" paper (original transformer paper)
   - "The Illustrated Transformer" by Jay Alammar (blog)
   - Sebastian Raschka's "Understanding Large Language Models" (free chapters)
   - 3Blue1Brown's "Attention in transformers, visually explained" (YouTube)
2. **Mathematical Deep Dive**:
   - "Mathematics for Machine Learning" by Deisenroth (free PDF) - Chapters on Linear Algebra & Probability
   - Andrej Karpathy's "Let's build GPT from scratch" (YouTube)

Practical Exercise: Build a mini-transformer from scratch in TensorFlow for a simple task (e.g., sentiment analysis on financial news). Focus on implementing attention mechanism manually.

Project: Create a financial sentiment analyzer using transformer architecture, documenting the mathematical intuition behind each component.

Week 3-4: Pre-training, Fine-tuning & Transfer Learning

Learning Objectives:

- Understand different pre-training objectives (MLM, CLM, etc.)
- Master fine-tuning strategies and when to use each

- Learn about parameter-efficient fine-tuning (LoRA, Adapters)

Resources:

1. **Core Concepts**:
   - Hugging Face Course (continue from Chapter 7, complete till Chapter 10)
   - "Parameter-Efficient Transfer Learning for NLP" paper
   - "LoRA: Low-Rank Adaptation" paper and implementation guide
2. **Hands-on**:
   - Hugging Face Transformers documentation (fine-tuning guides)
   - "Fine-Tuning BERT for Text Classification" tutorials

Practical Exercise: Fine-tune BERT/DistilBERT on financial text classification (e.g., earnings call sentiment, credit risk assessment from textual data)

Project: Build a financial document classifier that can categorize bank reports, earnings calls, and regulatory filings. Use techniques like LoRA for efficient fine-tuning.

Phase 2: Specialized NLP for Finance (Weeks 5-8)

Week 5-6: Financial NLP Tasks & Domain Adaptation

Learning Objectives:

- Master financial text preprocessing and domain-specific challenges
- Understand financial entity recognition and relationship extraction
- Learn about financial document summarization and key information extraction

Resources:

1. **Financial NLP Specifics**:
   - "Financial Sentiment Analysis" research papers on ArXiv
   - FinBERT paper and implementation
   - SEC-BERT and other financial language models documentation
2. **Industry Context**:
   - "Natural Language Processing in Finance" (free research papers)
   - Financial datasets: SEC filings, earnings calls transcripts, financial news

Practical Exercise: Build a named entity recognition (NER) system for financial documents that can identify companies, financial instruments, monetary amounts, and regulatory terms.

Project: Create a comprehensive financial document analysis pipeline that can:

- Extract key financial metrics from earnings reports
- Summarize lengthy regulatory filings
- Identify risk factors and business opportunities

Week 7-8: Advanced NLP Applications

Learning Objectives:

- Master question-answering systems for financial documents
- Understand retrieval-augmented generation (RAG) systems
- Learn about conversational AI for financial advisory

Resources:

1. **QA & RAG Systems**:
   - "Dense Passage Retrieval" paper
   - LangChain documentation and tutorials
   - Pinecone/Weaviate vector database tutorials (free tiers available)
2. **Conversational AI**:
   - "Building Conversational AI" course materials
   - Rasa documentation (open-source conversational AI)

Practical Exercise: Build a RAG system that can answer questions about financial documents using vector databases and retrieval mechanisms.

Project: Develop a "Financial Advisor Chatbot" that can:

- Answer questions about investment strategies from regulatory filings
- Provide risk assessments based on company financial reports
- Explain complex financial concepts in simple terms

Phase 3: Large Language Models & Production (Weeks 9-12)

Week 9-10: Modern LLMs & Prompt Engineering

Learning Objectives:

- Understand GPT family evolution (GPT-1 to GPT-4+)
- Master prompt engineering techniques and best practices
- Learn about in-context learning and few-shot prompting

Resources:

1. **LLM Architecture**:
   - "Language Models are Few-Shot Learners" (GPT-3 paper)
   - "Training language models to follow instructions" (InstructGPT paper)
   - OpenAI's GPT-4 technical report
2. **Prompt Engineering**:
   - "Prompt Engineering Guide" (open-source guide)
   - "Chain-of-Thought Prompting" papers
   - LangChain prompt engineering documentation

Practical Exercise: Develop sophisticated prompts for financial analysis tasks, comparing zero-shot, few-shot, and chain-of-thought approaches.

Project: Create a "Financial Analysis Assistant" using prompt engineering that can:

- Generate investment recommendations with reasoning
- Analyze company financials and provide insights
- Create risk assessment reports from multiple data sources

Week 11-12: Model Deployment & MLOps for LLMs

Learning Objectives:

- Learn LLM deployment strategies and optimization
- Understand model serving, caching, and scaling
- Master monitoring and evaluation of LLM applications

Resources:

1. **Deployment & Serving**:
   - Hugging Face Model Hub and Spaces documentation
   - FastAPI advanced features for ML serving
   - Docker for ML applications (free resources)
2. **MLOps for LLMs**:
   - "MLOps for Language Models" guides
   - Weights & Biases (free tier) for experiment tracking
   - DVC (Data Version Control) documentation

Practical Exercise: Deploy your financial analysis models using FastAPI, implement proper logging, monitoring, and A/B testing capabilities.

Project: Build a production-ready financial NLP API that includes:

- Model versioning and rollback capabilities
- Performance monitoring and alerting
- Cost optimization and caching strategies

Phase 4: Portfolio Development & Job Preparation (Weeks 13-16)

Week 13-14: Capstone Project & Portfolio Enhancement

Learning Objectives:

- Integrate all learned concepts into a comprehensive project
- Create professional documentation and presentation materials
- Optimize existing projects for maximum impact

Capstone Project Ideas:

1. **Comprehensive Financial Intelligence Platform**:
   - Multi-modal analysis (text + numerical data)
   - Real-time news sentiment impact on stock prices
   - Regulatory compliance monitoring system
2. **AI-Powered Credit Risk Assessment**:
   - Combine traditional financial metrics with alternative data (social media, news)
   - Explainable AI for regulatory compliance
   - Bias detection and mitigation

Portfolio Requirements:

- 4-5 polished projects showcasing different aspects of LLM/NLP
- Professional README files with clear problem statements, methodologies, and results
- Live demos or interactive notebooks
- Technical blog posts explaining your approach and learnings

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Week 15-16: Interview Preparation & Industry Connections

Learning Objectives:

- Master technical interviews for AI/ML roles
- Understand business case studies relevant to finance/consulting
- Build industry connections and personal brand

Interview Preparation:

1. **Technical Topics**:
   - Transformer architecture deep-dive
   - Trade-offs in model selection and fine-tuning
   - Production deployment challenges and solutions
   - Ethics and bias in financial AI systems
2. **Business Cases**:
   - ROI calculation for AI projects
   - Risk assessment for AI deployment in regulated industries
   - Data privacy and compliance (GDPR, financial regulations)

Networking & Applications:

- LinkedIn optimization with AI/LLM keywords
- Contribute to open-source LLM projects
- Write technical blog posts on Medium/LinkedIn
- Engage with AI communities (Reddit r/MachineLearning, Twitter AI community)

Continuous Learning Resources

Essential Papers to Read:

1. "Attention Is All You Need" (Transformer)
2. "BERT: Pre-training of Deep Bidirectional Transformers"
3. "Language Models are Few-Shot Learners" (GPT-3)
4. "Training language models to follow instructions" (InstructGPT)
5. "LoRA: Low-Rank Adaptation of Large Language Models"

Key Conferences & Communities:

- NeurIPS, ICML, ACL, EMNLP (follow proceedings)
- Hugging Face community forums
- Papers With Code for latest implementations
- AI/ML Twitter community for industry updates

Financial AI Specific Resources:

- FinBERT and other financial language models
- Financial NLP workshops and papers

- RegTech (Regulatory Technology) communities

Success Metrics & Milestones

Weekly Checkpoints:

- [ ] Completed theoretical learning goals
- [ ] Implemented practical exercises
- [ ] Updated GitHub with new code
- [ ] Documented learnings in technical notes

Monthly Milestones:

- **Month 1**: Strong transformer & fine-tuning foundation
- **Month 2**: Financial NLP expertise with domain projects
- **Month 3**: LLM proficiency with production deployment experience
- **Month 4**: Complete portfolio + active job search + interview readiness

Final Portfolio Checklist:

- [ ] 4-5 polished projects with clear documentation
- [ ] At least 2 financial/fintech focused projects
- [ ] 1 production-deployed application with monitoring
- [ ] Technical blog posts explaining key concepts
- [ ] Strong LinkedIn presence with AI/LLM focus
- [ ] Open-source contributions to relevant projects

Budget-Friendly Premium Resources (If Needed):

1. **Andrew Ng's Deep Learning Specialization** (~$49/month, financial aid available)
2. **Fast.ai Practical Deep Learning for Coders** (Free, but consider supporting)
3. **Coursera's Natural Language Processing Specialization** (Financial aid available)
4. **Udacity's Machine Learning Engineer Nanodegree** (Often has scholarships)

Final Notes:

This plan is designed to be intensive but achievable given your strong foundation. Focus on building a portfolio that tells a story of your journey from economics to AI, emphasizing the unique perspective you bring to financial applications.

Remember to document your learning journey through blog posts or LinkedIn articles - this will help with personal branding and demonstrate your communication skills to potential employers.

The key differentiator will be your ability to bridge business understanding (from your economics background) with technical AI/LLM skills, especially in the financial domain where regulatory knowledge and business acumen are crucial.