**Training Course Syllabus**

1. **Course Title:** Application of Large Language Models (LLMs) in Telecommunications
2. **Dates:** 19 – 22 August 2025 (4 days)
3. **Venue:** Institute of ICT, Ministry of Technology and Communications,

Vientiane, Lao PDR

1. **Abstract:**

Nowadays, it is apparent that Artificial Intelligence technology plays an important role in every sector. In telecommunication sector, Large Language Models (LLMs) are Artificial Intelligence (AI) systems that can generate and understand human-like language. They have the potential to transform the telecommunications industry by automating tasks and improving customer service.

This course will serve as an introduction of LLM and how to integrate LLM with existing IT infrastructure and how to build user interfaces for interaction with LLM-based systems.

1. **Course Objectives:**

The objectives of this course are as following:

* Understand the fundamentals of artificial intelligence, natural language processing, and the evolution of large language models.
* Explore the role and applications of LLMs in the telecommunications sector, including customer support, network management, and service delivery.
* Gain technical expertise in transformer-based architectures, fine-tuning methodologies, and evaluation techniques.
* Develop practical skills in preparing, fine-tuning, and deploying LLMs for telecommunication-specific tasks.
* Recognize ethical considerations, compliance standards, and future trends in LLMs for telecommunications.
* Apply hands-on experience to create a proposal for integrating LLMs in real-world telecommunication scenarios.

1. **Outline of Training Courses**

**Module 1: Introduction to Large Language Models**

* Overview of Artificial Intelligence and Machine Learning Overview
* Natural Language Processing (NLP) fundamentals
* Evolution from Statistical Models to Transformers
* Understanding GPT, BERT, and other LLMs.

**Module 2: Fundamentals of LLMs in Telecommunications**

* Role of LLMs in communication services
* Applications of LLMs in customer support, network management, and service delivery
* Case studies of LLM implementation in the telecommunications sector

**Module 3: Technical Deep Dive into LLMs**

* Transformer architecture
* Model parameters, layers, and training processes
* Data requirements for LLM training (quality, quantity, diversity)

**Module 4: RAG Systems for Telecommunication Applications**

* Introduction to RAG concepts and advantages over fine-tuning
* Knowledge base development for telecommunications
* Vector databases and embeddings implementation
* Retrieval strategies and prompt engineering for RAG
* Mini Lab: Google Colab introduction and setup

**Module 5: Implementing LLMs in Telecommunications**

* Integration with existing IT infrastructure
* Building user interfaces for LLM-based systems
* Scalability and maintenance considerations
* RAG pipeline architecture and data ingestion workflows
* Hands-on Lab: Basic RAG implementation using Google Colab

**Technical Requirements:**

* Google account access
* Stable Internet connection
* Pre-prepared Colab notebooks with telecommunications datasets

**Module 6: Practical RAG Implementation Workshop**

* Pre-configured Google Colab notebooks setup
* Building a knowledge base with telecommunications documents
* Implementing vector embeddings using free-tier services
* Creating RAG-powered customer support chatbot
* Testing with real telecommunication scenarios
* Group project: Customizing RAG system for specific use cases
* Project presentations and peer review

**Module 7: Ethical Considerations and Compliance**

* Addressing bias and fairness in language models
* Ethical AI use in telecommunications
* Global data protection compliance (GDPR, CCPA, etc.)

**Module 8: Future Trends and Innovations**

* Advances in model architecture and training techniques
* Emerging applications in 5G, IoT, and beyond
* LLMs' role in shaping future communication technologies
* Group Project Presentations

1. **Course schedule**

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| **Schedule** | **Topic** | **Speaker** |
| **Day 1: 19 August 2025** | | | |
| 09.00 - 9.30 | * Opening Ceremony | APT |
| 09.30 - 12.00 | **Module 1: Introduction to Large Language Models**   * Overview of Artificial Intelligence and Machine Learning Overview * Natural Language Processing (NLP) fundamentals * Evolution from Statistical Models to Transformers * Understanding GPT, BERT, and other LLMs.   **Module 2: Fundamentals of LLMs in Telecommunications**   * Role of LLMs in communication services * Applications of LLMs in customer support, network management, and service delivery * Case studies of LLM implementation in the telecommunications sector | Pongthiti Pongsilamanee,  Ph.D.  (Senior Instructor, NT Academy,National Telecom Public Company Limited) |
| 13.00 - 16.00 | **Module 3: Technical Deep Dive into LLMs**   * Transformer architecture * Model parameters, layers, and training processes * Data requirements for LLM training (quality, quantity, diversity) | Mr. Amornpan Phornchaichareon  (National Telecom Public Company Limited) |
| **Day 2: 20 August 2025** | | | |
| 09.00-12.00 | **Module 4: RAG Systems for Telecommunication Applications**   * Introduction to RAG concepts and advantages over fine-tuning * Knowledge base development for telecommunications * Vector databases and embeddings implementation * Retrieval strategies and prompt engineering for RAG * Mini Lab: Google Colab introduction and setup | Mr. Amornpan Phornchaichareon |
| 13.00-16.00 | **Module 5: Implementing LLMs in Telecommunications**   * Integration with existing IT infrastructure * Building user interfaces for LLM-based systems * Scalability and maintenance considerations * RAG pipeline architecture and data ingestion workflows * Hands-on Lab: Basic RAG implementation using Google Colab   **Technical Requirements:**   * Google account access * Stable Internet connection * Pre-prepared Colab notebooks with telecommunications datasets |
| **Day 3: 21 August 2025** | | |
| 09.30-12.00 | **Module 6: Practical RAG Implementation Workshop**   * Pre-configured Google Colab notebooks setup * Building a knowledge base with telecommunications documents * Implementing vector embeddings using free-tier services | Mr. Amornpan Phornchaichareon |
| 13.00-16.00 | **Module 6: Practical RAG Implementation Workshop**  **(Cont.)**   * Creating RAG-powered customer support chatbot * Testing with real telecommunication scenarios * Group project: Customizing RAG system for specific  use cases * Project presentations and peer review |
| **Day 4: 22 August 2025** | | |
| 09.30-12.00 | **Module 7: Ethical Considerations and Compliance**   * Addressing bias and fairness in language models * Ethical AI use in telecommunications * Global data protection compliance (GDPR, CCPA, etc.) | Mr. Amornpan Phornchaichareon |
| 13.00-16.00 | **Module 8: Future Trends and Innovations**   * Advances in model architecture and training techniques * Emerging applications in 5G, IoT, and beyond * LLMs' role in shaping future communication technologies * Group Project Presentations |