NeuroCogniAI

Certified AI Professional For Neuro Healthcare

Course Duration: 3 Months

Course Technologies Stack:

1. Neuro Healthcare Data Exploration / Augmentation Stack

- Neuro Diseases Categories & Prediction Types [Alzheimer's, Parkinson's, Brain Tumors etc].
- Fetching / Exploration of Neuro Datasets [ADNI, OASIS].
- Data Formats of MRI / fMRI [Niftii, Dicom], Data Formats Conversion.
- Neuro Data Augmentation Using Python / Neuro Medical Tools.

2. Neuro HealthCare MRI / fMRI Data Analysis / Modeling Stack

- Introduction to Neuro Imaging Analysis Tools
- Neuro MRI / fMRI Loading [Niftii, Dicom] Imaging Formats
- Introduction of Transfer Learning Models [ResNet, DenseNet,VGG16/19].
- Introduction to Transformers [Encoders / Decoders] , GAN [Generative Adversial Networks]
- Explainable AI [XAI] For the Interpretation of Model Inference.
- Explainable AI Methods [LIME, SHAP, GRAD-CAM etc].

3. Neuro HealthCare Reporting Analysis Stack

- Introduction to Neuro Healthcare MRI / fMRI Reports.
- Design Pattern of MRI / fMRI Reports for different categories of Neuro Deceases [Alzheimer's, Parkinson's, Brain Tumors etc]
- Neuro Deceases Analysis Reports Using AI Imaging Tools.
- Neuro Decease Diagnosis & Prognosis Project

Detail Course Structure For Certified AI Professional For Neuro Healthcare

Month 1: Neuro Healthcare Data Exploration & Augmentation

Week 1: Introduction to Neuro Diseases & Prediction Types

- Overview of Neuro Diseases (Alzheimer's, Parkinson's, Brain Tumors, etc.)
- Introduction to Neuroimaging modalities (MRI, fMRI).
- Introduction to Neuropsychological Assessments.
- Overview of Prediction Types and Clinical Significance.

Week 2: Fetching & Exploring Neuro Datasets

- Introduction to ADNI and OASIS datasets.
- Data access and download procedures.
- Basic data exploration using Python (Pandas, NumPy).
- Understanding dataset structure and metadata.

Week 3: MRI / fMRI Data Formats & Conversion

- Detailed explanation of NIfTI and DICOM formats.
- Python libraries for handling these formats (Nibabel, FmriPrep, MRIcroML).
- Data format conversion techniques.
- Visualization of MRI/fMRI data.

Week 4: Neuro Data Processing & Augmentation

- Image preprocessing techniques (noise reduction, bias field correction).
- Introduction to data augmentation concepts.
- Spatial transformations (rotation, translation, scaling).
- Implementation using Python libraries (Scikit-image, SimpleITK).

Month 2: AI Modeling for Neuroimaging Analysis

Week 5: Introduction to Neuro Imaging Analysis Tools

- Overview of FSL, SPM, ANTs, Nilearn, and Python-integrable libraries.
- Understanding their functionalities and applications.

Week 6: Loading and Visualizing Neuroimaging Data

- Practical sessions: loading Nifti and DICOM in Python.
- Techniques for visualizing 3D and 4D neuroimaging data.
- Identifying key features and anomalies through visualization.

Week 7: Transfer Learning for Neuroimage Analysis

- Concept of transfer learning in medical imaging.
- Exploring pre-trained models (ResNet, DenseNet, VGG16/19).
- Adapting models for neuroimage classification and segmentation.
- Hands-on exercises with TensorFlow/PyTorch.

Week 8: Advanced Deep Learning Models: Transformers and GANs

- Introduction to Transformer networks for sequence-based analysis (fMRI).
- Understanding encoder-decoder architecture.
- Introduction to GANs for neuroimage synthesis and augmentation.
- Exploring potential applications in neuro healthcare.

Month 3: <u>Interpretation, Reporting, and Project</u>

Week 9: Explainable AI (XAI) for Neuroimage Interpretation

- Importance of interpretability in medical AI.
- Introduction to XAI concepts and techniques.
- Need for transparency and trust in AI solutions.

Week 10: Explainable AI Methods: LIME, SHAP, GRAD-CAM

- In-depth exploration of LIME, SHAP, and GRAD-CAM.
- Practical implementation for understanding model decisions.
- Visualizing and interpreting explanations.

Week 11: Neuro Healthcare MRI/fMRI Reports and Design Patterns

- Structure and content of standard clinical reports.
- Key information for different neuro diseases.
- Designing effective report templates for AI-driven analysis.
- Emphasizing clarity and clinical relevance.

Week 12: Neuro Disease Diagnosis & Prognosis Project and Course Conclusion

- Final project: diagnosis/prognosis of a specific neuro disease using AI.
- Involves data preprocessing, model development, evaluation, and report generation.
- Final project presentations and feedback.

Tools and Technologies:

- Python (Pandas, NumPy, Scikit-learn, Scikit-image, Nibabel, FmriPrep, MRIcroGL)
- TensorFlow/PyTorch
- OpenAI API, Gemini API, Hugging Face Transformers
- LIME, SHAP, GRAD-CAM
- NIfTI and DICOM viewers / Converters

Assessment:

- Weekly assignments and quizzes.
- Mid-term project.
- Final project (diagnosis/prognosis of a specific neuro disease using AI & Neuro Convolutional Explainable Model).
- Class participation and presentations.

NOTE: This structure ensures a **Progressive Learning Approach**, covering **Neuro Healthcare AI** concepts, leading up to hands-on project deployment.