**DEEP LEARNING TECHNICAL SKILLS**

**1. Programming Languages**

* **Python: The primary language used for deep learning projects.**
  + **Libraries:**
    - **TensorFlow: Open-source library for deep learning.**
    - **Keras: High-level API for building and training deep learning models.**
    - **PyTorch: A flexible and powerful library for deep learning with dynamic computation graphs.**
* **R: Often used for statistical analysis and has deep learning libraries like keras and tensorflow.**
* **C++: Useful for performance optimization in deep learning models, particularly with frameworks like TensorFlow.**

**2. Deep Learning Frameworks**

* **TensorFlow: Comprehensive library for deep learning; includes tools for production deployment.**
* **Keras: High-level interface for TensorFlow, making it easier to build and train neural networks.**
* **PyTorch: Preferred for research and applications that require flexibility in building models.**
* **MXNet: An efficient deep learning framework often used for cloud-based applications.**
* **Caffe: A deep learning framework focusing on speed and modularity.**

**3. Core Deep Learning Concepts**

* **Neural Networks: Understanding architectures like:**
  + **Feedforward Neural Networks**
  + **Convolutional Neural Networks (CNNs): Used for image processing tasks.**
  + **Recurrent Neural Networks (RNNs): For sequence data, including LSTMs and GRUs.**
  + **Generative Adversarial Networks (GANs): For generating new data samples.**
  + **Transformers: Architecture for NLP tasks and more recently, vision tasks.**
* **Optimization Algorithms: Knowledge of techniques like SGD, Adam, RMSprop for training models.**
* **Loss Functions: Familiarity with loss functions such as Mean Squared Error, Cross-Entropy, and custom loss functions.**

**4. Data Preprocessing**

* **Image Preprocessing: Techniques like normalization, augmentation (flipping, rotation), and resizing.**
* **Text Preprocessing: Tokenization, stemming, lemmatization, and embedding techniques (Word2Vec, GloVe, BERT).**
* **Feature Engineering: Creating meaningful features to improve model performance.**

**5. Model Evaluation**

* **Metrics: Understanding of evaluation metrics for regression (MAE, RMSE) and classification (accuracy, precision, recall, F1-score, AUC-ROC).**
* **Hyperparameter Tuning: Techniques such as Grid Search, Random Search, and Bayesian optimization.**

**6. Deployment and Production**

* **Model Deployment: Tools and platforms for deploying models into production (AWS SageMaker, Google AI Platform, TensorFlow Serving).**
* **APIs: Creating RESTful APIs to serve models using frameworks like Flask or FastAPI.**
* **Docker/Kubernetes: For containerizing applications and orchestrating deployments.**

**7. Version Control and Collaboration**

* **Git: For version control and collaboration in coding projects.**
* **Jupyter Notebooks: For prototyping and sharing work in an interactive format.**

**8. Cloud Computing**

* **AWS: Using services like EC2, S3, and SageMaker for training and deploying models.**
* **Google Cloud Platform: BigQuery, AutoML, and AI Platform for scalable solutions.**
* **Microsoft Azure: Azure Machine Learning for model training and deployment.**

**CERTIFICATION FOR DEEP LEARNING**

**1. Deep Learning Specialization (Coursera - Andrew Ng)**

* A comprehensive series covering neural networks, CNNs, RNNs, and more using TensorFlow and Keras.

**2. TensorFlow Developer Certificate**

* Validates proficiency in building and training models using TensorFlow, covering foundational concepts and practical applications.

**3. Microsoft Certified: Azure AI Engineer Associate**

* Focuses on implementing AI solutions on Azure, including building and deploying models using Azure Machine Learning.

**4. AWS Certified Machine Learning – Specialty**

* Validates skills in building, training, and deploying machine learning models on AWS.

**5. IBM AI Engineering Professional Certificate**

* Covers machine learning and deep learning concepts and practical applications using IBM Watson and TensorFlow.

**6. NVIDIA Deep Learning Institute Certifications**

* Provides specialized training in deep learning, including frameworks like TensorFlow and PyTorch, and focuses on GPU programming.

**7. Cloudera Certified Professional Data Engineer**

* Focuses on designing and building robust data pipelines and includes elements of machine learning and deep learning.