EUROPEAN INFORMATION TECHNOLOGIES CERTIFICATION INSTITUTE, ASBL.

Brussels, Belgium, European Union

# CERTIFICATE

## Vuk Vujovic

Has successfully completed test requirements of
The European Information Technologies Certification Programme

## EITC/AI/GCML Google Cloud Machine Learning

**Certification Programme examination result:** 73.33%

**Certification Programme description:**

Introduction: what is machine learning; First steps in Machine Learning: the 7 steps of machine learning, plain and simple estimators, serverless predictions at scale, TensorBoard for model visualization, deep neural networks and estimators; Further steps in Machine Learning: big data for training models in the cloud, natural language generation, distributed training in the cloud, machine learning use case in fashion, data wrangling with pandas (Python Data Analysis Library), introduction to Kaggle Kernels, working with Jupyter, choosing Python package manager; Google tools for Machine Learning: Google Cloud Datalab - notebook in the cloud, printing statements in TensorFlow, TensorFlow object detection on iOS, visualizing data with Facets, Google Quick Draw - doodle dataset, Google machine learning overview; Advancing in Machine Learning: GCP BigQuery and open datasets, data science project with Kaggle, AutoML Vision, Scikit-learn, Scikit-learn models at scale, Introduction to Keras, scaling up Keras with estimators, introduction to TensorFlow.js, importing Keras model into TensorFlow.js, deep learning VM Images, TensorFlow Hub for more productive machine learning, TensorFlow Eager Mode, Jupyter on the web with Colab, upgrading Colab with more compute, Kubeflow - machine learning on Kubernetes, BigQuery ML - machine learning with standard SQL; Expertise in Machine Learning: PyTorch on GCP, AutoML Tables, TensorFlow privacy, visualizing convolutional neural networks with Lucid, understanding image models and predictions using an Activation Atlas, natural language processing - bag of words, AutoML natural language for custom text classification, Tensor Processing Units - history and hardware, diving into the TPU v2 and v3; Google Cloud AI Platform: AI Platform training with built-in algorithms, training models with custom containers on Cloud AI Platform, using the What-If tool for explainability, introduction to Explanations for AI Platform, Cloud AI Data labeling service, introduction to JAX, setting up AI Platform Pipelines, AI Platform Optimizer, persistent Disk for productive data science, translation API, AutoML Translation

**Certificate Programme version/revision: EITC/AI/GCMLv1r1**

CERTIFICATE ID: **EITC/AI/GCML/SLJ24004676**

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DATE OF ISSUE:
June 2024
Brussels, Belgium
**European Union**

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# CERTIFICATE

## Vuk Vujovic

Has successfully completed test requirements of
The European Information Technologies Certification Programme

### EITC/AI/GVAPI Google Vision API

**Certification Programme examination result:** 60%

**Certification Programme description:**

Introduction: introduction to the Google Cloud Vision API, introduction to the Google Cloud Vision API in Python; Getting started: configuration and setup; Understanding text in visual data: detecting and extracting text from image, detecting and extracting text from handwriting, detecting and extracting text from files (PDF/TIFF); Understanding images: detecting crop hints, detecting faces, image properties detection; Labelling images: labels detection; Advanced images understanding: detecting landmarks, detecting logos, objects detection, explicit content detection (safe search feature); Understanding web visual data: detecting web entities and pages; Understanding shapes and objects: drawing object borders using pillow python library

**Certificate Programme version/revision: EITC/AI/GVAPIv1r1**

CERTIFICATE ID: **EITC/AI/GVAPI/SLJ24004676**

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DATE OF ISSUE:
July 2024
Brussels, Belgium
**European Union**

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Brussels, Belgium, European Union

# CERTIFICATE

## Vuk Vujovic

Has successfully completed test requirements of
The European Information Technologies Certification Programme

## EITC/AI/TFF TensorFlow Fundamentals

**Certification Programme examination result:** 80%

**Certification Programme description:**

Introduction to TensorFlow: fundamentals of machine learning, basic computer vision with ML, introducing convolutional neural networks, building an image classifier; Neural Structured Learning with TensorFlow: Neural Structured Learning framework overview, training with natural graphs, training with synthesized graphs, adversarial learning for image classification; Natural Language Processing with TensorFlow: tokenization, sequencing - turning sentences into data, training a model to recognize sentiment in text, ML with recurrent neural networks, long short-term memory for NLP, training AI to create poetry; Programming TensorFlow: introduction to TensorFlow coding, introducing TensorFlow Lite, TensorFlow Lite for Android, TensorFlow Lite for iOS, TensorFlow.js, TensorFlow.js in your browser, preparing dataset for machine learning, building a neural network to perform classification, using TensorFlow to classify clothing images; Text classification with TensorFlow: preparing data for machine learning, designing a neural network; Overfitting and underfitting problems: solving model's overfitting and underfitting problems; Advancing in TensorFlow: saving and loading models, TensorFlow Lite, experimental GPU delegate; TensorFlow in Google Colaboratory: getting started with Google Colaboratory, getting started with TensorFlow in Google Colaboratory, building a deep neural network with TensorFlow in Colab, how to take advantage of GPUs and TPUs for your ML project, upgrade your existing code for TensorFlow 2.0, using TensorFlow to solve regression problems; TensorFlow 2.0: introduction to TensorFlow 2.0; TensorFlow high-level APIs: loading data, going deep on data and features, building and refining your models; TensorFlow Extended (TFX): ML engineering for production ML deployments with TFX, what exactly is TFX, TFX pipelines, metadata, distributed processing and components, model understanding and business reality; TensorFlow Applications: Air Cognizer predicting air quality with ML, helping Doctors Without Borders staff prescribe antibiotics for infections, helping doctors detect respiratory diseases using machine learning, utilizing deep learning to predict extreme weather, helping paleographers transcribe medieval text with ML, Airbnb using ML categorize its listing photos, using machine learning to tackle crop disease, AI helping to predict floods, positive current, Daniel and the sea of sound, beneath the canopy, using machine learning to predict wildfires, tracking asteroids with machine learning, identifying potholes on Los Angeles roads with ML, dance Like, an app that helps users learn how to dance using machine learning, how machine learning is being used to help save the world's bees

**Certificate Programme version/revision: EITC/AI/TFFv1r1**

CERTIFICATE ID: **EITC/AI/TFF/SLJ24004676**

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DATE OF ISSUE:
August 2024
Brussels, Belgium
**European Union**

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Brussels, Belgium, European Union

# CERTIFICATE

## Vuk Vujovic

Has successfully completed test requirements of
The European Information Technologies Certification Programme

### EITC/AI/MLP Machine Learning with Python

**Certification Programme examination result:** 73.33%

**Certification Programme description:**

Introduction: introduction to practical machine learning with Python; Regression: introduction to regression, regression features and labels, regression training and testing, regression forecasting and predicting, pickling and scaling, understanding regression; Programming machine learning: programming the best fit slope, programming the best fit line, R squared theory, programming R squared, testing assumptions, introduction to classification with K nearest neighbors, K nearest neighbors application, Euclidean distance, defining K nearest neighbors algorithm, programming own K nearest neighbors algorithm, applying own K nearest neighbors algorithm, summary of K nearest neighbors algorithm; Support vector machine: support vector machine introduction and application, understanding vectors, support vector assertion, support vector machine fundamentals, support vector machine optimization, creating an SVM from scratch, SVM training, SVM optimization, completing SVM from scratch, kernels introduction, reasons for kernels, soft margin SVM, soft margin SVM and kernels with CVXOPT, SVM parameters; Clustering, k-means and mean shift: clustering introduction, handling non-numerical data, K means with titanic dataset, custom K means, K means from scratch, mean shift introduction, mean shift with titanic dataset, mean shift from scratch, mean shift dynamic bandwidth

**Certificate Programme version/revision: EITC/AI/MLPv1r1**

CERTIFICATE ID: **EITC/AI/MLP/SLJ24004676**

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DATE OF ISSUE:
September 2024
Brussels, Belgium
**European Union**

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Brussels, Belgium, European Union

# CERTIFICATE

## Vuk Vujovic

Has successfully completed test requirements of
The European Information Technologies Certification Programme

## EITC/AI/DLTF Deep Learning with TensorFlow

**Certification Programme examination result:** 80%

**Certification Programme description:**

Introduction: introduction to deep learning with neural networks and TensorFlow; TensorFlow: installing TensorFlow, TensorFlow basics, neural network model, running the network, processing data, preprocessing conitnued, training and testing on data, using more data, installing the GPU version of TensorFlow for making use of a CUDA GPU, installing CPU and GPU TensorFlow on Windows; Recurrent neural networks in TensorFlow: recurrent neural networks (RNN), RNN example in Tensorflow; Convolutional neural networks in TensorFlow: convolutional neural networks basics, convolutional neural networks with TensorFlow; TensorFlow Deep Learning Library: TFLearn; Training a neural network to play a game with TensorFlow and Open AI: introduction, training data, training model, testing network; Using convolutional neural network to identify dogs vs cats: introduction and preprocessing, building the network, training the network, using the network; 3D convolutional neural network with Kaggle lung cancer detection competiton: introduction, reading files, visualizing, resizing data, preprocessing data, running the network; Deep learning in the browser with TensorFlow.js: introduction, basic TensorFlow.js web application, AI Pong in TensorFlow.js, training model in Python and loading into TensorFlow.js; Creating a chatbot with deep learning, Python, and TensorFlow: introduction, data structure, buffering dataset, determining insert, building database, database to training data, training a model, NMT concepts and parameters, interacting with the chatbot

**Certificate Programme version/revision: EITC/AI/DLTFv1r1**

CERTIFICATE ID: **EITC/AI/DLTF/SLJ24004676**

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DATE OF ISSUE:
October 2024
Brussels, Belgium
**European Union**

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Brussels, Belgium, European Union

# CERTIFICATE

## Vuk Vujovic

Has successfully completed test requirements of
The European Information Technologies Certification Programme

## EITC/AI/DLPTFK Deep Learning with Python, TensorFlow and Keras

**Certification Programme examination result:** 93.33%

**Certification Programme description:**

Introduction: deep learning with Python, TensorFlow and Keras; Data: loading in your own data; Convolutional neural networks (CNN): introduction to convolutional neural networks (CNN); TensorBoard: analyzing models with TensorBoard, optimizing with TensorBoard, using trained model; Recurrent neural networks: introduction to Recurrent Neural Networks (RNN), introduction to Cryptocurrency-predicting RNN, normalizing and creating sequences Crypto RNN, balancing RNN sequence data, cryptocurrency-predicting RNN Model

**Certificate Programme version/revision: EITC/AI/DLPTFKv1r1**

CERTIFICATE ID: **EITC/AI/DLPTFK/SLJ24004676**

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DATE OF ISSUE:
November 2024
Brussels, Belgium
**European Union**

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Brussels, Belgium, European Union

# CERTIFICATE

## Vuk Vujovic

Has successfully completed test requirements of
The European Information Technologies Certification Programme

### EITC/AI/DLPP Deep Learning with Python and PyTorch

**Certification Programme examination result:** 66.67%

**Certification Programme description:**

Introduction: introduction to deep learning with Python and Pytorch; Data: datasets; Neural network: building neural network, training model; Convolution neural network (CNN): introdution to Convnet with Pytorch, training Convnet; Advancing with deep learning: computation on the GPU, model analysis

**Certificate Programme version/revision: EITC/AI/DLPPv1r1**

CERTIFICATE ID: **EITC/AI/DLPP/SLJ24004676**

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DATE OF ISSUE:
February 2025
Brussels, Belgium
**European Union**

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Brussels, Belgium, European Union

# CERTIFICATE

## Vuk Vujovic

Has successfully completed test requirements of
The European Information Technologies Certification Programme

## EITC/AI/ADL Advanced Deep Learning

**Certification Programme examination result:** 60%

**Certification Programme description:**

Introduction: introduction to advanced machine learning approaches; Neural networks: neural networks foundations; Advanced computer vision: convolutional neural networks for image recognition, advanced models for computer vision; Optimization: optimization for machine learning; Recurrent neural networks: sequences and recurrent networks; Natural language processing: advanced deep learning for natural language processing; Attention and memory: attention and memory in deep learning; Generative adversarial networks: advances in generative adversarial networks; Unsupervised learning: unsupervised representation learning; Advanced generative models: modern latent variable models; Responsible innovation: responsible innovation and artificial intelligence

**Certificate Programme version/revision: EITC/AI/ADLv1r1**

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DATE OF ISSUE:
March 2025
Brussels, Belgium
**European Union**

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Brussels, Belgium, European Union

# CERTIFICATE

## Vuk Vujovic

Has successfully completed test requirements of
The European Information Technologies Certification Programme

## EITC/AI/ARL Advanced Reinforced Learning

**Certification Programme examination result:** 66.67%

**Certification Programme description:**

Introduction: introduction to reinforcement learning; Tradeoff between exploration and exploitation: exploration and exploitation; Markov decision processes: Markov decision processes and dynamic programming: Prediction and control: model-free prediction and control; Deep reinforcement learning: function approximation and deep reinforcement learning, policy gradients and actor critics, planning and models, advanced topics in deep, reinforcement learning, deep reinforcement learning agents; Case studies: classic games case study, AlphaGo mastering Go, AlphaZero mastering chess, Shogi and Go, AlphaZero defeating Stockfish in chess, AlphaStar mastering StartCraft II

**Certificate Programme version/revision: EITC/AI/ARLv1r1**

CERTIFICATE ID: **EITC/AI/ARL/SLJ24004676**
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DATE OF ISSUE:
April 2025
Brussels, Belgium
**European Union**

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# CERTIFICATE

## Vuk Vujovic

Has successfully completed test requirements of
The European Information Technologies Certification Programme

## EITC/AI/TFQML TensorFlow Quantum Machine Learning

**Certification Programme examination result:** 93.33%

**Certification Programme description:**

Introduction: introduction to Google AI Quantum, introduction to quantum computing; Implementing quantum computer: building a quantum computer with superconducting qubits; Programming quantum computer: programming a quantum computer with Cirq; Quantum supremacy: quantum supremacy explained, control of transmon qubits using a cryogenic CMOS integrated circuit, quantum supremacy: benchmarking the Sycamore processor, extracting coherence information from random circuits, estimation of statistical significance of quantum supremacy; Overview of TensorFlow Quantum: TensorFlow Quantum: a software platform for hybrid quantum-classical ML, layer-wise learning for quantum neural networks; Practical TensorFlow Quantum - binary classifier: using Tensorflow Quantum for simple quantum binary classification; Practical Tensorflow Quantum - XOR problem: solving the XOR problem with quantum machine learning with TFQ, quantum XOR decision boundary with TFQ; Quantum reinforcement learning: replicating reinforcement learning with quantum variational circuits with TFQ; Quantum Approximate Optimization Algorithm (QAOA): quantum Approximate Optimization Algorithm (QAOA) with Tensorflow Quantum; Variational Quantum Eigensolver (VQE): variational Quantum Eigensolver (VQE) in Tensorflow Quantum for single qubit Hamiltonians, variational Quantum Eigensolver (VQE) in TensorFlow-Quantum for 2 qubit Hamiltonians, optimizing VQE's with Rotosolve in Tensorflow Quantum

**Certificate Programme version/revision: EITC/AI/TFQMLv1r1**

CERTIFICATE ID: **EITC/AI/TFQML/SLJ24004676**

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DATE OF ISSUE:
June 2025
Brussels, Belgium
**European Union**

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Brussels, Belgium, European Union

# CERTIFICATE

## Vuk Vujovic

Has successfully completed test requirements of
The European Information Technologies Certification Programme

### EITC/CP/PPF Python Programming Fundamentals

**Certification Programme examination result:** 80%

**Certification Programme description:**

Introduction: introduction to Python 3 programming; Getting started: tuples, strings, loops, lists and Tic Tac Toe game; Functions: built-in functions, indexes and slices, functions, function parameters and typing; Advancing in Python: mutability revisited, error handling, calculating horizontal winner, vertical winners, diagonal winning algorithm, iterators / iterables; Wrap up: wrapping up TicTacToe; Summarizing conclusion

**Certificate Programme version/revision: EITC/CP/PPFv1r1**

CERTIFICATE ID: **EITC/CP/PPF/SLJ24004676**
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DATE OF ISSUE:
June 2024
Brussels, Belgium
**European Union**

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# CERTIFICATE

## Vuk Vujovic

Has successfully completed test requirements of
The European Information Technologies Certification Programme

## EITC/CL/GCP Google Cloud Platform

**Certification Programme examination result:** 80%

**Certification Programme description:**

Introductions: the essentials of GCP, GCP free tier and free trial, GCP console tour, GCP developer and management tools; GCP basic concepts: Compute Engine, Cloud Storage, Cloud SQL, BigQuery, Dataflow, Google Kubernetes Engine GKE, Cloud CDN, Cloud Operations, Load Balancing, High Performance Computing; GCP overview: GCP Compute Engine overview, GCP Machine Learning overview, GCP Serverless overview, GCP Data and Storage overview, GCP hands-on, GCP continuous learning, running containers on GCP, GCP and Firebase with projects and storage, GCP and Firebase with functions and Firestore, GCP logging, GCP error reporting, GCP debugging, GCP code and build tools; Getting started with GCP: Cloud SQL, Datastore, Cloud Spanner, Cloud Shell, Cloud VPC, Persistent Disks, Bigtable using Cloud Shell, App Engine Python, Cloud Storage, Compute Engine, Cloud Pub/Sub, Cloud IoT Core, Deployment Manager, Resource Access Control, text parsing and analysis with Python, text parsing and analysis for Node.js, text parsing and analysis for Go, converting speech to text with Node.js, translating speech using cURL, securing App Engine apps, setting up BigQuery sandbox, CLI for GCP, Private Container Registry/Storage, build and package container artifacts, Cloud Functions quickstart, Managed Kubernetes quickstart, BigQuery Web UI quickstart, Cloud Endpoints quickstart, image recognition and classification with Cloud Vision, running a query with BigQuery Web UI, loading local data into BigQuery using the Web UI, setting up cost controls for BigQuery, locating and querying public datasets, copying datasets in BigQuery, querying CloudSQL from BigQuery, making data public in Cloud Storage, using object versioning; GCP networking: Virtual Private Cloud (VPC), Google Cloud Interconnect, Firewall Rules, IP Addresses, Network Address Translation (NAT), shared VPC, VPC Peering, routing, Cloud Router, Load Balancing, limiting public IPs; GCP serverless with Cloud Run: introduction to Cloud Run, Cloud Run examplary deployment, Cloud Run developments; GCP labs: access control with Cloud IAM, machine learning with Cloud ML Engine, scalable storage, meaningful insights with BigQuery, scalable apps with App Engine, containerized apps with Kubernetes Engine, connecting GCP services with Cloud Functions, health monitoring with Stackdriver, Google Cloud Deployment Manager, event driven processing with Cloud Pub/Sub, Slack Bot with Node.js on Kubernetes, exploring NCAA data with BigQuery, scalable database service with Cloud Spanner, speech recognition using Machine Learning, processing text with Cloud Natural Language, analyzing large datasets with Cloud Datalab, personalization of G Suite Admin, IoT devices at scale with IoT Core, Apache Spark and Hadoop with Cloud Dataproc, Qwikilabs for Google Cloud hands-on practice, Cloud SDK essential command-line tools, PostgreSQL and MySQL databases with Cloud SQL, IoT Analytics Pipeline, helping to organize world's genomic information with Google Genomics, protecting sensitive data with Cloud Data Loss Prevention, Container-Optimized OS, massive workloads with Cloud Bigtable Database Service, Google Cloud Video Intelligence, running WordPress on App Engine Flexible Environment; GCP security: securing cloud environment, top 3 risks - access, top 3 risks - data, top 3 risks - platform, securing customer data, securing hardware, Cloud Armor, Data Center security layers; GCP support: filing a case with Support Portal, filing a case with Cloud Console, enabling role based support, contacting phone support, granting support roles for GCP users, overview of GCP support, GCP support narrative, GCP support escalations

**Certificate Programme version/revision: EITC/CL/GCPv1r1**

CERTIFICATE ID: **EITC/CL/GCP/SLJ24004676**

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DATE OF ISSUE:
June 2024
Brussels, Belgium
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