ELE 503

Advanced Computer Programming and Statistics

Week#1: General Overview of Software Engineering, DevOps, and Infrastructure

By Kingsley E. Erhabor

Week 01.

General Overview of Software Engineering, DevOps, and Infrastructure

Fundamentals of Software Engineering
Principles and Methodologies

DevOps Practices
Role in Modern Software Development

IT Infrastructure and Cloud Computing
Applications in Engineering

AI & Recent Developments
Understanding AI, GPTs and RAGs design

Q&A
Closing Take away

Efosa's Introduction

Engineer | Programmer | Innovator

Technical Authority

Shell Nigeria

Subject Mater Expert (EMEA) for Process Automation & Control (PACO)-Subsea control systems and Subsea Distribution

Containerization 85 %

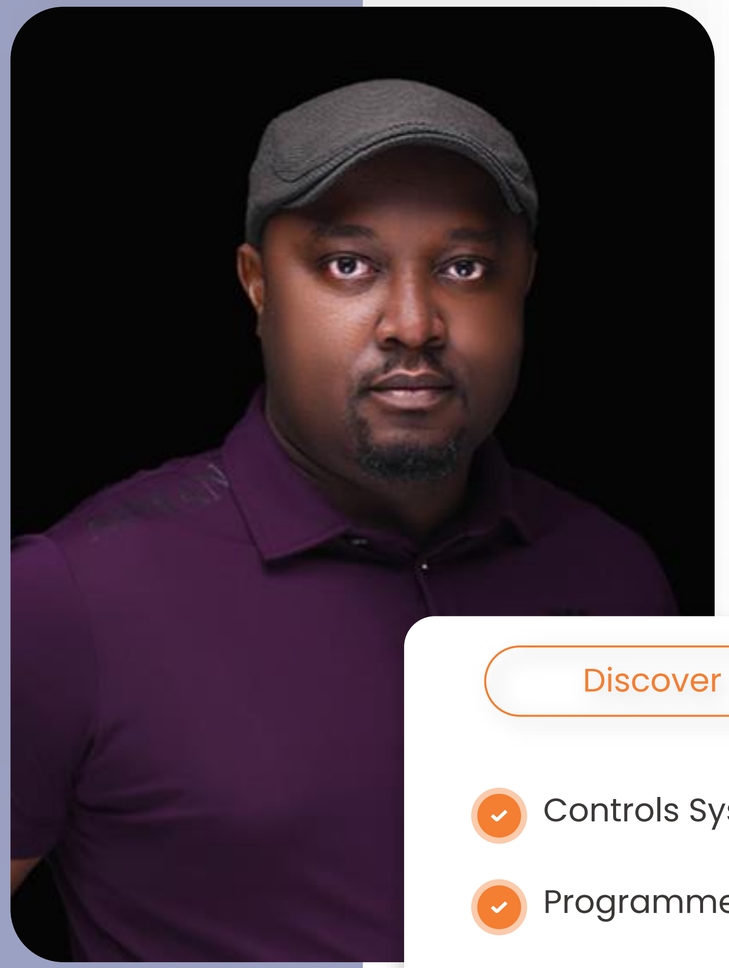
AI & ML 80 %

Renewable Energy 90 %

Innovator, VC

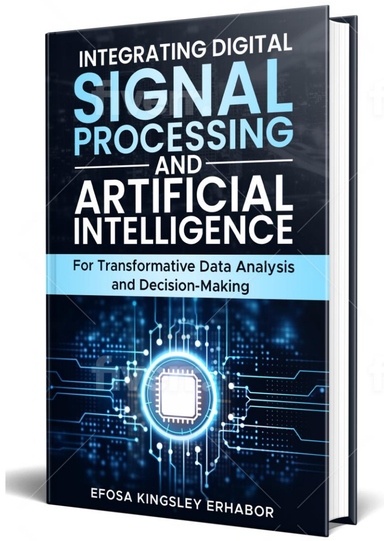
Katharos Technologies

Linux, Devops, AI and Software SME, Innovator and enterprenur



Discover

- Controls System
- Programmer
- Subsea Engineer
- AI and ML



X or Twitter

Linkedin

Part 1:

Fundamentals of Software Engineering

What is Software Engineering?

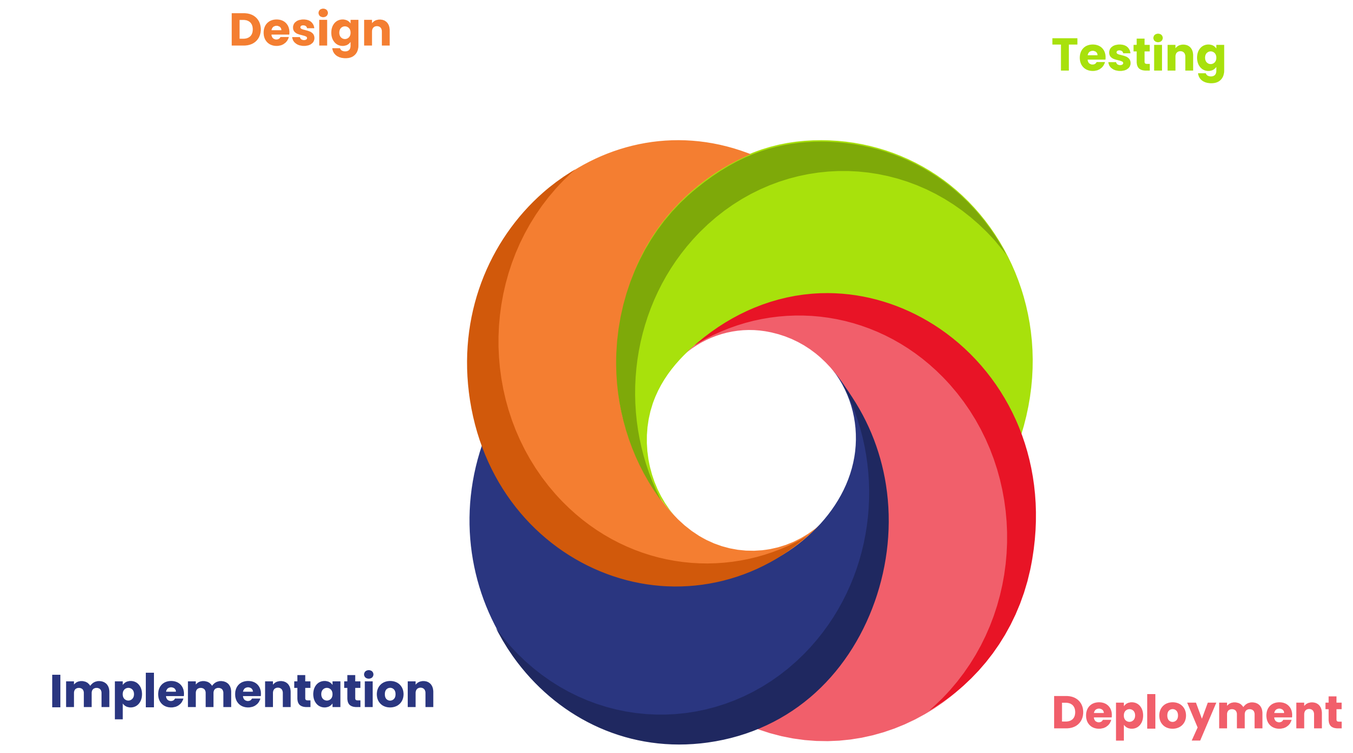
ELE 503: Advanced Computer Programming and Statistics

Definition:

- Application of engineering principles to software development in a systematic method.

Goal:

- Produce high-quality software that meets customer needs within time and budget constraints.



Software Engineering Principles

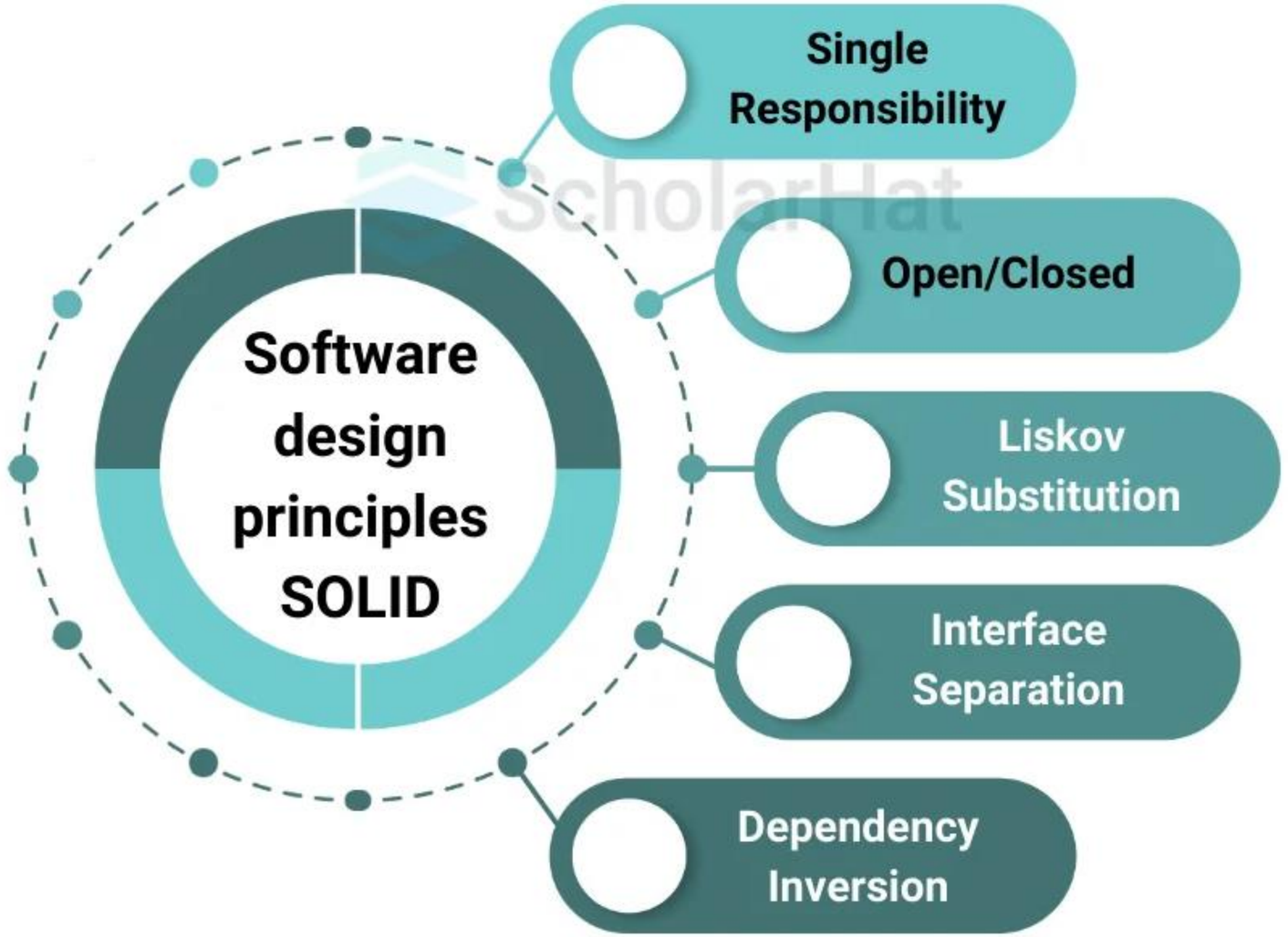
ELE 503: Advanced Computer Programming and Statistics

Modularity: Breaking down software into smaller, manageable components.

Abstraction: Hiding complex realities while exposing only the necessary parts.

Encapsulation: Bundling data with methods that operate on that data.

Separation of Concerns: Dividing a program into distinct features with minimal overlap.



Software Development Methodologies

ELE 503: Advanced Computer Programming and Statistics

Waterfall Model

- Sequential design process.

Agile Methodology

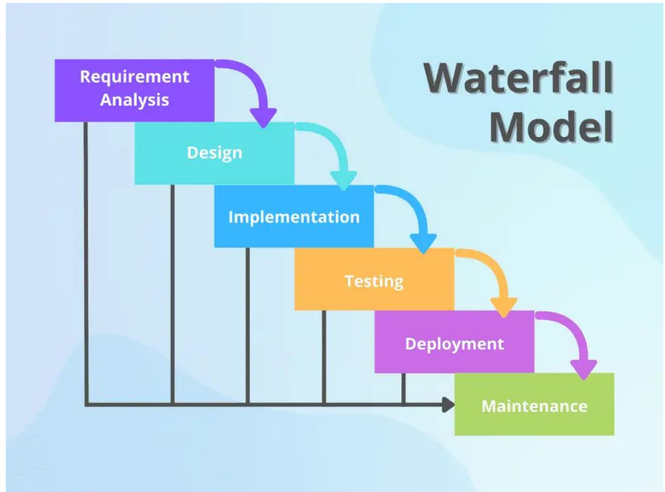
- Iterative and incremental approach.

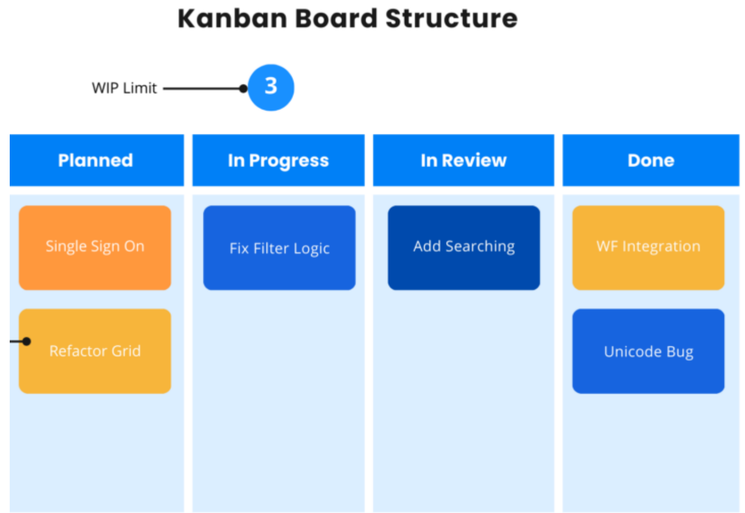
Scrum Framework

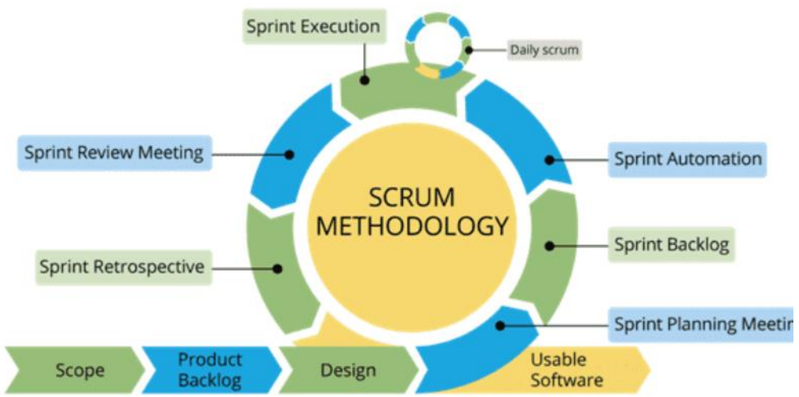
- Emphasizes teamwork, accountability, and iterative progress.

Kanban

- Visual process management system

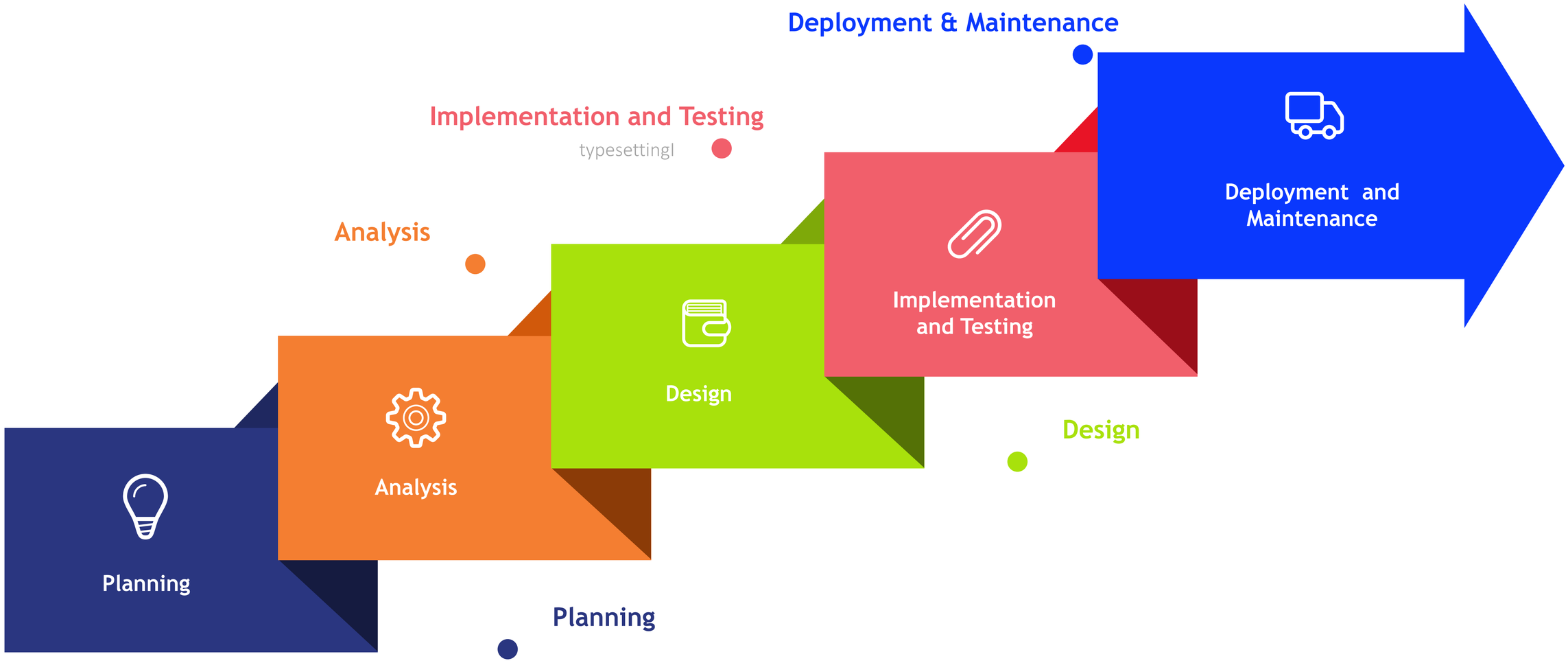






Software Development Lifecycle (SDLC)

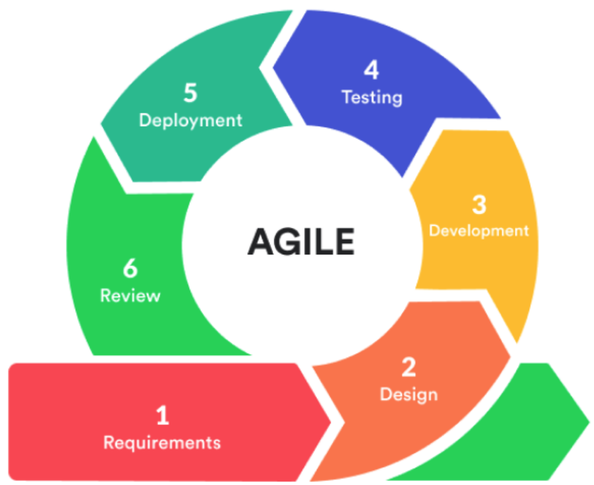
ELE 503: Advanced Computer Programming and Statistics



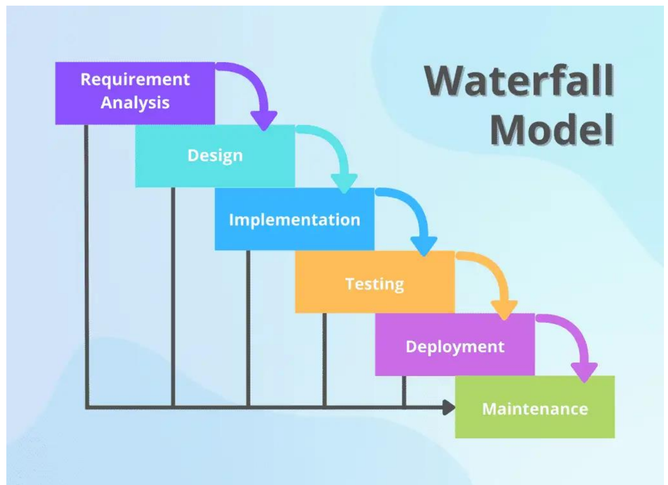
Agile vs. Waterfall

ELE 503: Advanced Computer Programming and Statistics

- **Agile**
  - Flexibility and customer involvement.
  - Adaptable to changes.



- **Waterfall**
  - Structured and linear.
  - Well-suited for projects with clearly defined requirements



Part 2:

DevOps Practices in Modern Software Development

Introduction to DevOps

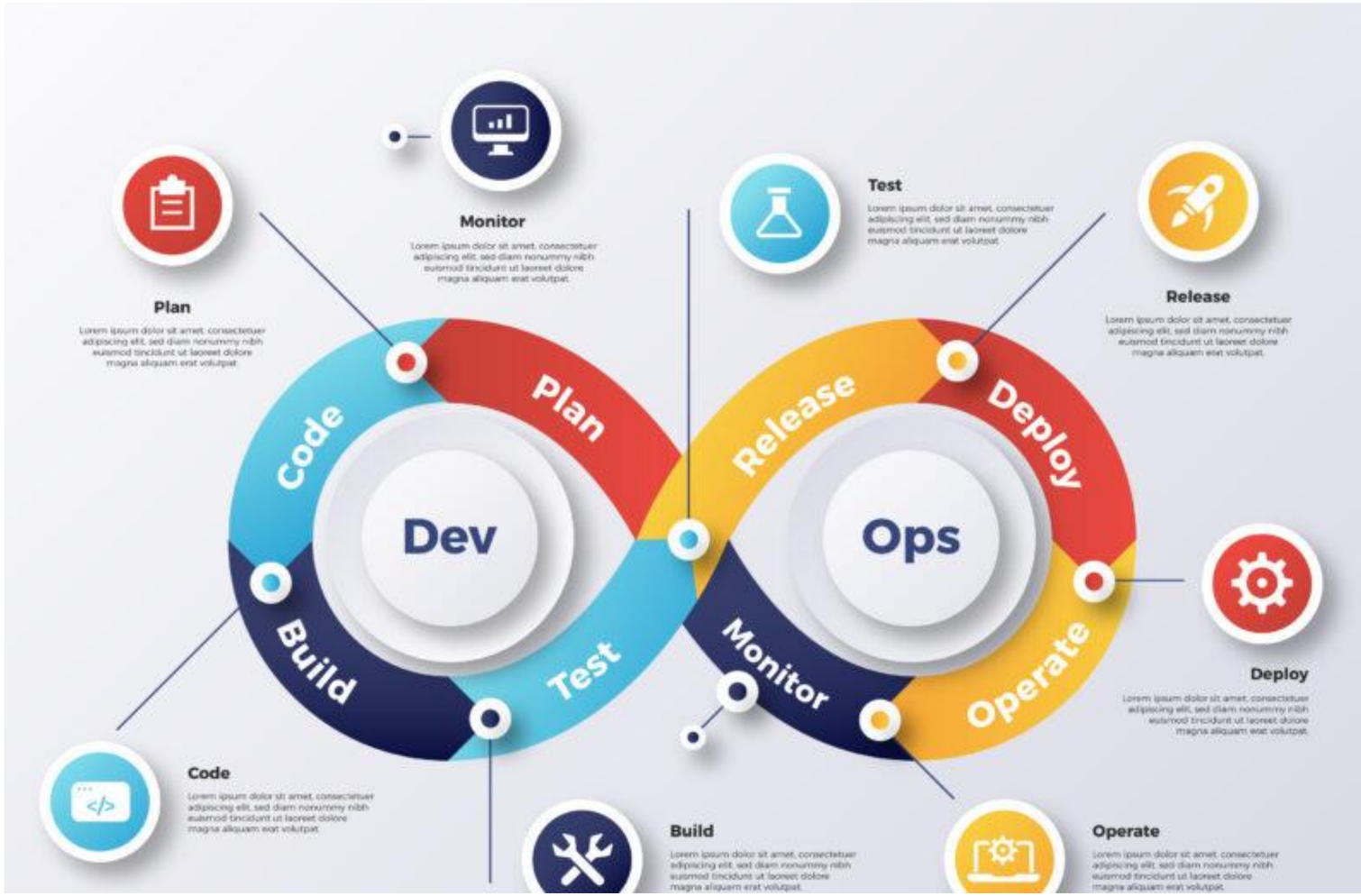
ELE 503: Advanced Computer Programming and Statistics

Definition:

A set of practices that combines software development (Dev) and IT operations (Ops).

Goal:

Shorten the development lifecycle and provide continuous delivery.



The Need for DevOps

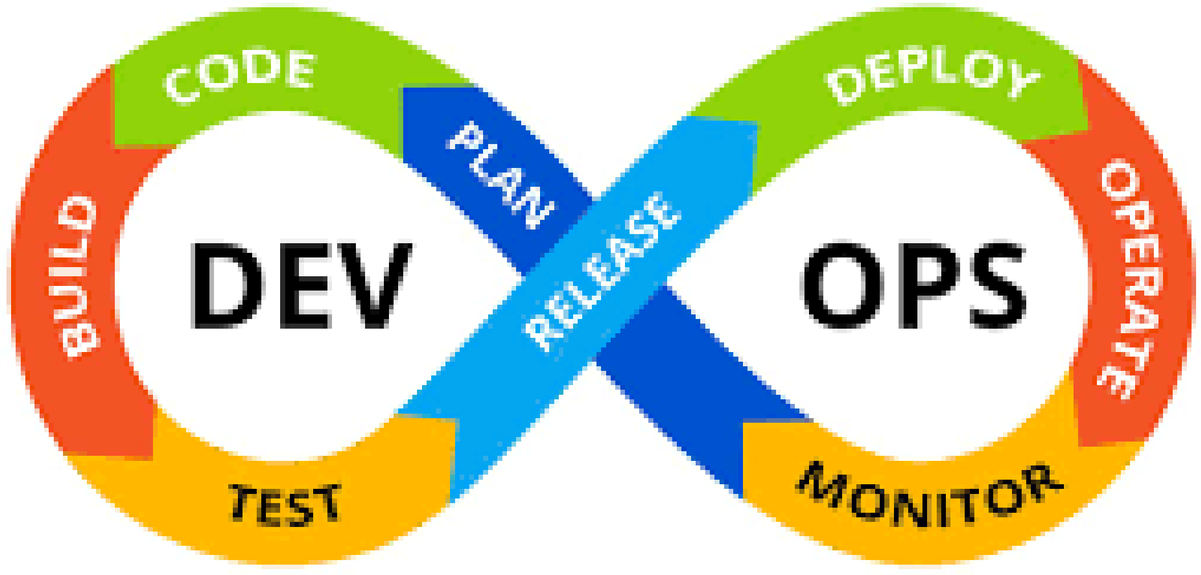
ELE 503: Advanced Computer Programming and Statistics

Challenges in Traditional Models

- Siloed teams.
- Slow release cycles.

Benefits of DevOps

- Enhanced collaboration.
- Faster time-to-market.



DevOps Culture and Principles

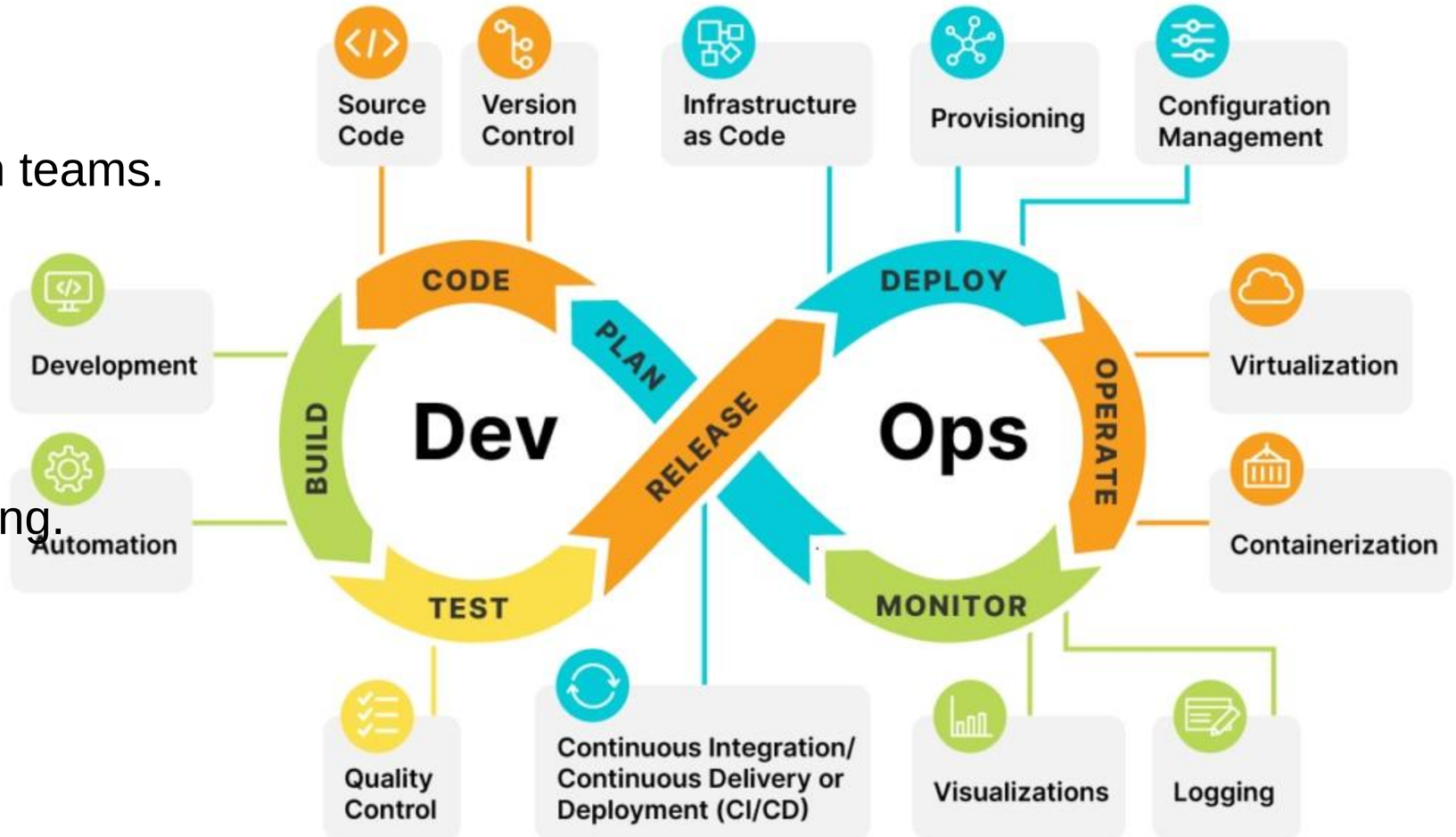
ELE 503: Advanced Computer Programming and Statistics

Collaboration:
Breaking down silos between teams.

Automation:
Streamlining processes.

Continuous Improvement:
Ongoing feedback and learning.

Measurement:
Data-driven decisions.



DevOps Practices

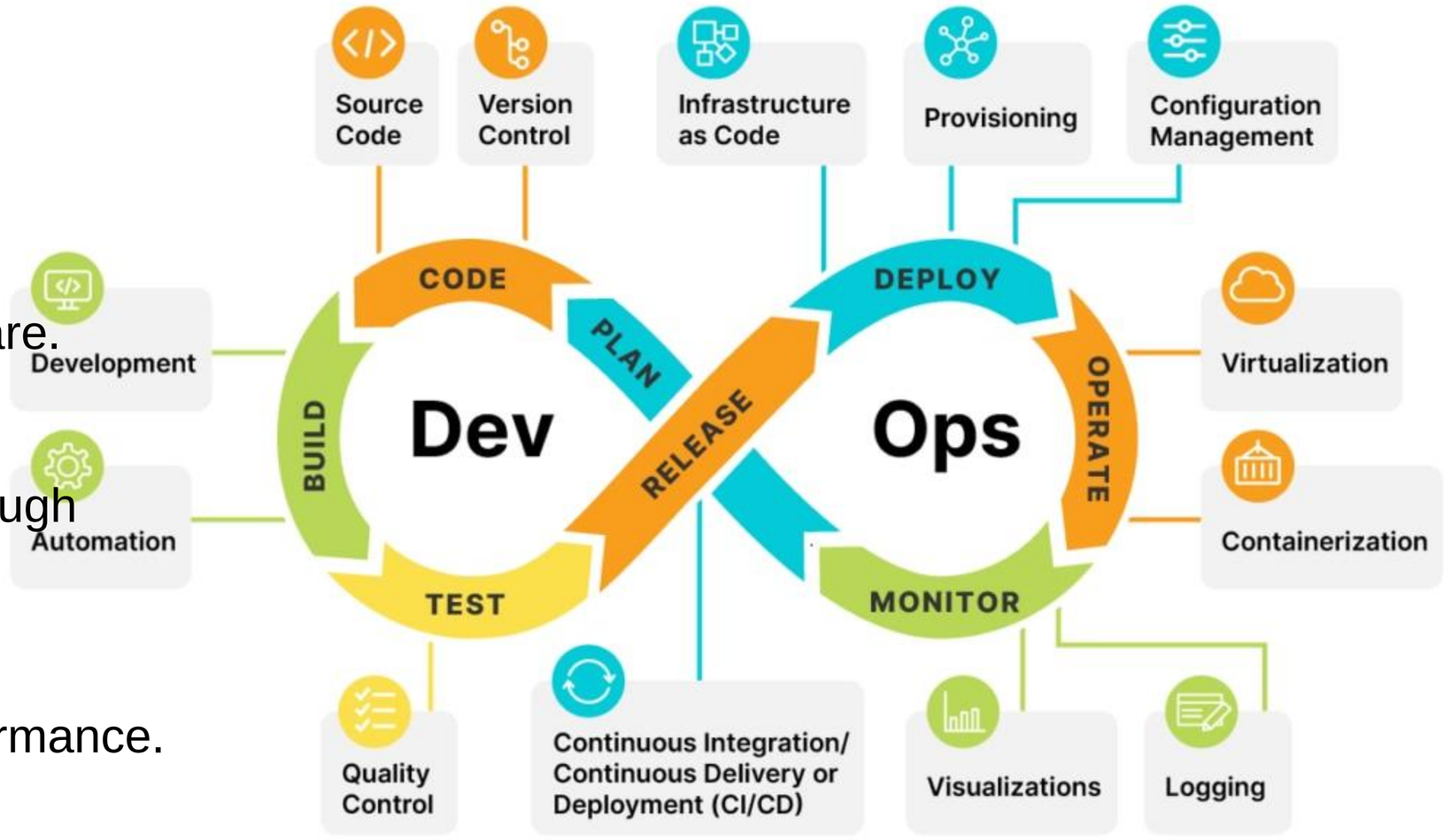
ELE 503: Advanced Computer Programming and Statistics

Continuous Integration (CI)
- Frequent code integration.

Continuous Delivery (CD)
- Automated release of software.

Infrastructure as Code (IaC)
- Managing infrastructure through code.

Monitoring and Logging
- Real-time insights into performance.



DevOps Pipeline Diagram

ELE 503: Advanced Computer Programming and Statistics

Value Proposition: "We recognize the importance of flexibility in employee learning. Our program are designed to accommodate busy schedules, allowing employees to access training materials at their convenience. This not only improves engagement but also enhances the overall learning experience."

Code

This is a sample text. You simply add your own

Test

This is a sample text. You simply add your own

Release

This is a sample text. You simply add your own

Operate

This is a sample text. You simply add your own

Build

This is a sample text. You simply add your own

Deploy

This is a sample text. You simply add your own

Monitor

This is a sample text. You simply add your own

Tools in DevOps

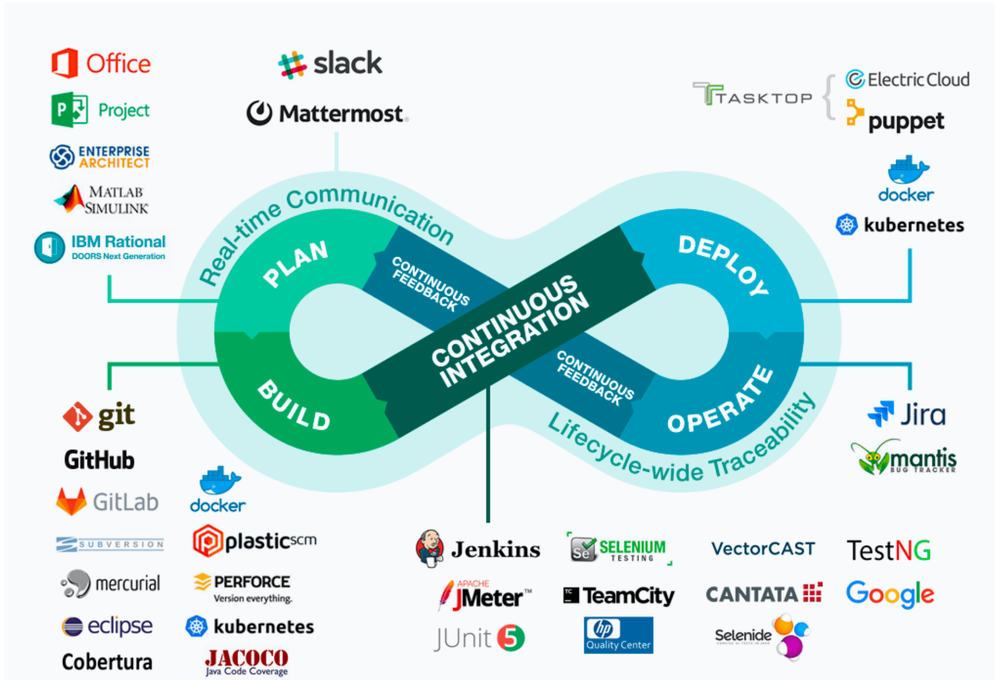
ELE 503: Advanced Computer Programming and Statistics

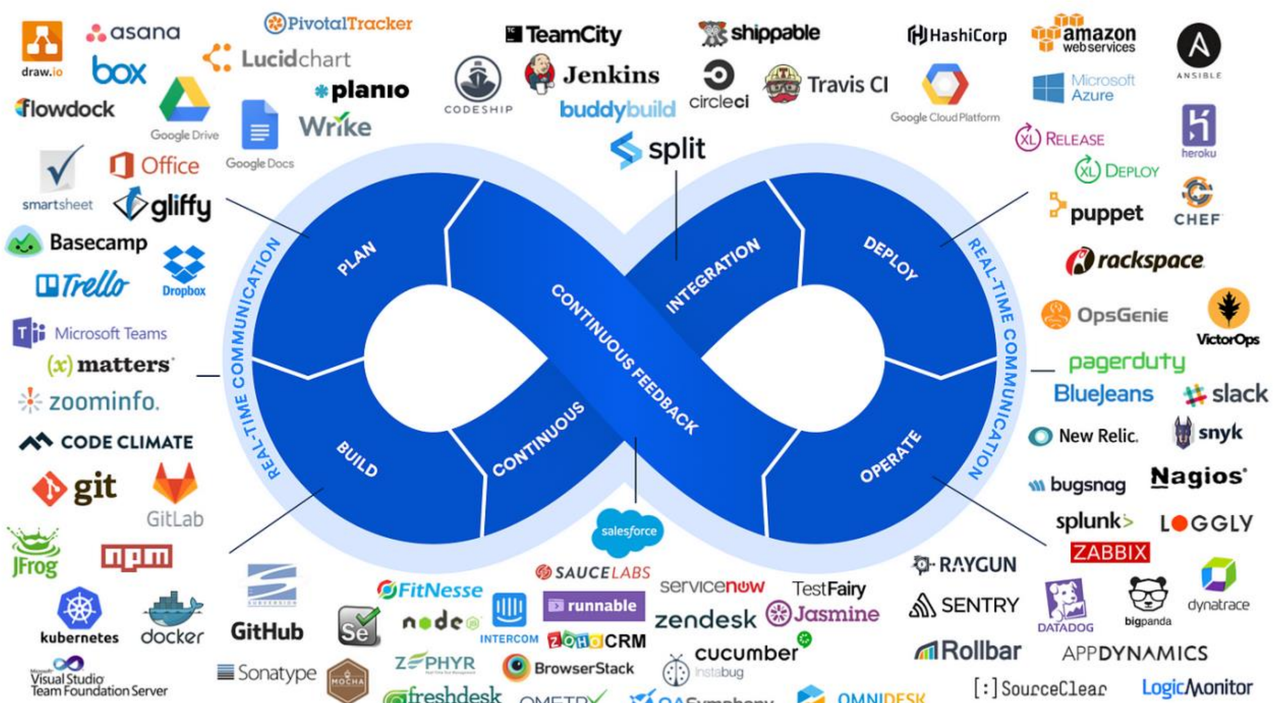
- **Version Control:**
  Git, SVN

- **CI/CD Pipelines:**
  Jenkins, Travis CI

- **Configuration Management:**
  Ansible, Puppet, Chef. Terraform

- **Monitoring:**
  Nagios, Prometheus, Grafana, message brokers like Mosquito MQTT





DevOps Engineer Job offering

ELE 503: Advanced Computer Programming and Statistics

DevOps Engineer
Red Hat Linux · Abuja, Federal Capital Territory, Nigeria (Remote)

Red Hat Linux

DevOps Engineer

Abuja, Federal Capital Territory, Nigeria · **3 hours ago** · 17 applicants

Remote · Full-time

Skills: Problem Solving, Kubernetes, +8 more

See how you compare to 86 applicants. Reactivate Premium

Am I a good fit for this job? How can I best position myse

Easy Apply Save

About the job

Company Description
Role Description

This is a full-time remote role for a DevOps Engineer at Red Hat Linux. The DevOps Engineer will be responsible for designing, implementing, and maintaining the company's infrastructure to ensure smooth deployment and operation of systems. They will work closely with software developers and IT teams to oversee code releases and improve processes.

Qualifications

- Proficiency in scripting languages such as Shell, Python, or Ruby
- Experience with containerization technologies like Docker and

DevOps Engineer
Red Hat Linux · Abuja, Federal Capital Territory, Nigeria (Remote)

About the job

Company Description
Role Description

This is a full-time remote role for a DevOps Engineer at Red Hat Linux. The DevOps Engineer will be responsible for designing, implementing, and maintaining the company's infrastructure to ensure smooth deployment and operation of systems. They will work closely with software developers and IT teams to oversee code releases and improve processes.

Qualifications

- Proficiency in scripting languages such as Shell, Python, or Ruby
- Experience with containerization technologies like Docker and Kubernetes
- Knowledge of CI/CD pipelines and automation tools such as Jenkins or Ansible
- Strong background in Linux/Unix administration and networking
- Understanding of cloud services like AWS, Azure, or Google Cloud Platform
- Excellent problem-solving and communication skills
- Ability to collaborate with cross-functional teams and prioritize tasks effectively
- Relevant certifications like AWS Certified DevOps Engineer or Certified Kubernetes Administrator (CKA) are a plus

show less

Set alert for similar jobs

DevOps Engineer, Abuja, Federal Capital Territory, Nigeria

combining using Large Language Models and automation to enhance document analysis, streamline contract reviews as well as ensure data security.

After the initial success of the product and the onboarding of their first clients, they are starting to scale and are looking to hire their first DevOps Engineer to lead the operational efforts for the business. You will work closely with the Head of Engineering on defining and building DevOps strategies and best practices including looking after their cloud ecosystem (Azure), leading the migration of their environment to run on agnostic Kubernetes, building a monitoring and alerting systems to optimise cost-effectiveness of the infrastructure.

You would get the opportunity to work independently and with full ownership of your work. Due to the start up environment, you would need to “wear many hats”, self motivate, and be able to upskill yourself when exploring new technical challenges for the team.

We are seeking a DevOps Engineer with:

- In-depth knowledge of the Kubernetes ecosystem
- Strong foundation in Azure cloud
- A track record of working with mission-critical systems, greenfield projects
- Familiarity with Python, FastAPI, Redis, Postgres, Websockets or Celery
- Previous start up experience would be a plus

Location: Fully remote (European Time Zone)
Salary: up to €90.000 (potentially negotiable) B2B

#devops #ai #legaltech

Easy Apply Save

Part 3:

IT Infrastructure and Cloud Computing

Overview of IT Infrastructure

ELE 503: Advanced Computer Programming and Statistics

Components:

- Hardware:
  - Servers, Storage, Networking devices.
- Software:
  - Operating systems, Middleware, Applications.
- Networking:
  - LAN, WAN, Internet connectivity.

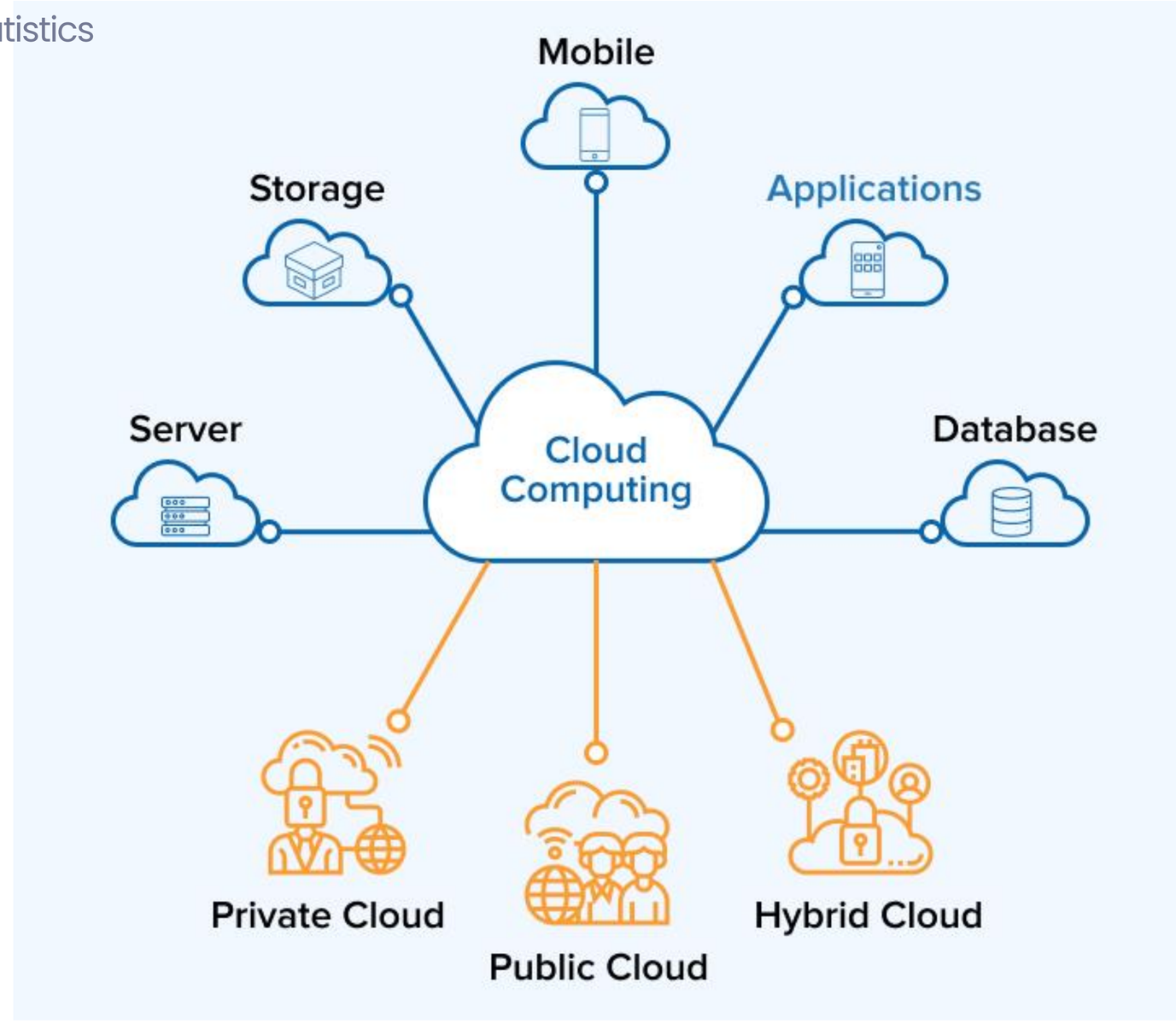
Introduction to Cloud Computing

ELE 503: Advanced Computer Programming and Statistics

Definition: Delivery of computing services over the internet.

Benefits:

- Scalability
- Cost-efficiency
- Accessibility



Cloud Service Models

ELE 503: Advanced Computer Programming and Statistics

Infrastructure as a Service (IaaS)

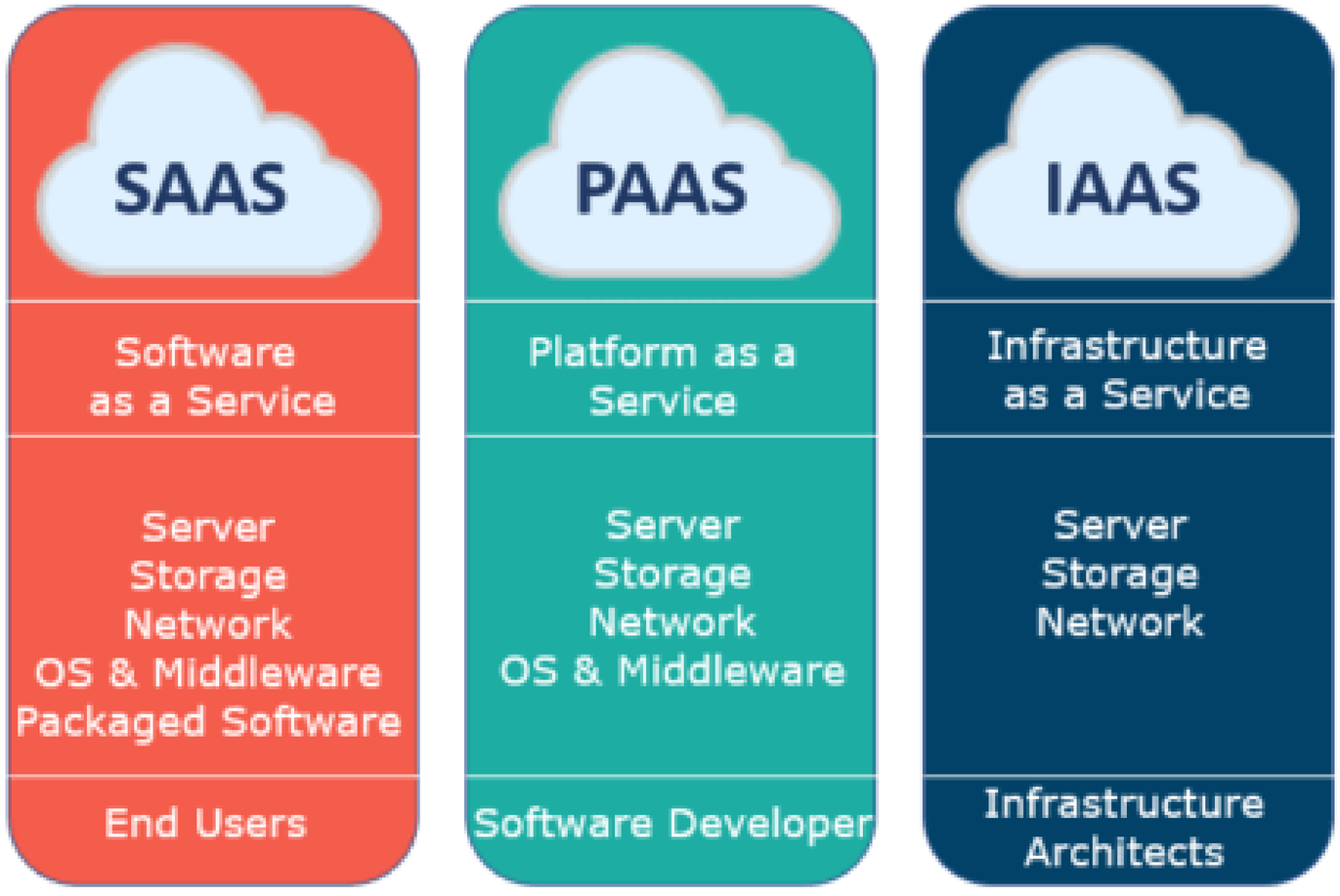
- Virtualized computing resources over the internet.

Platform as a Service (PaaS)

- Platform allowing customers to develop, run, and manage applications.

Software as a Service (SaaS)

- Software distribution model in which applications are hosted by a vendor.



Cloud Deployment Models

ELE 503: Advanced Computer Programming and Statistics

Public Cloud

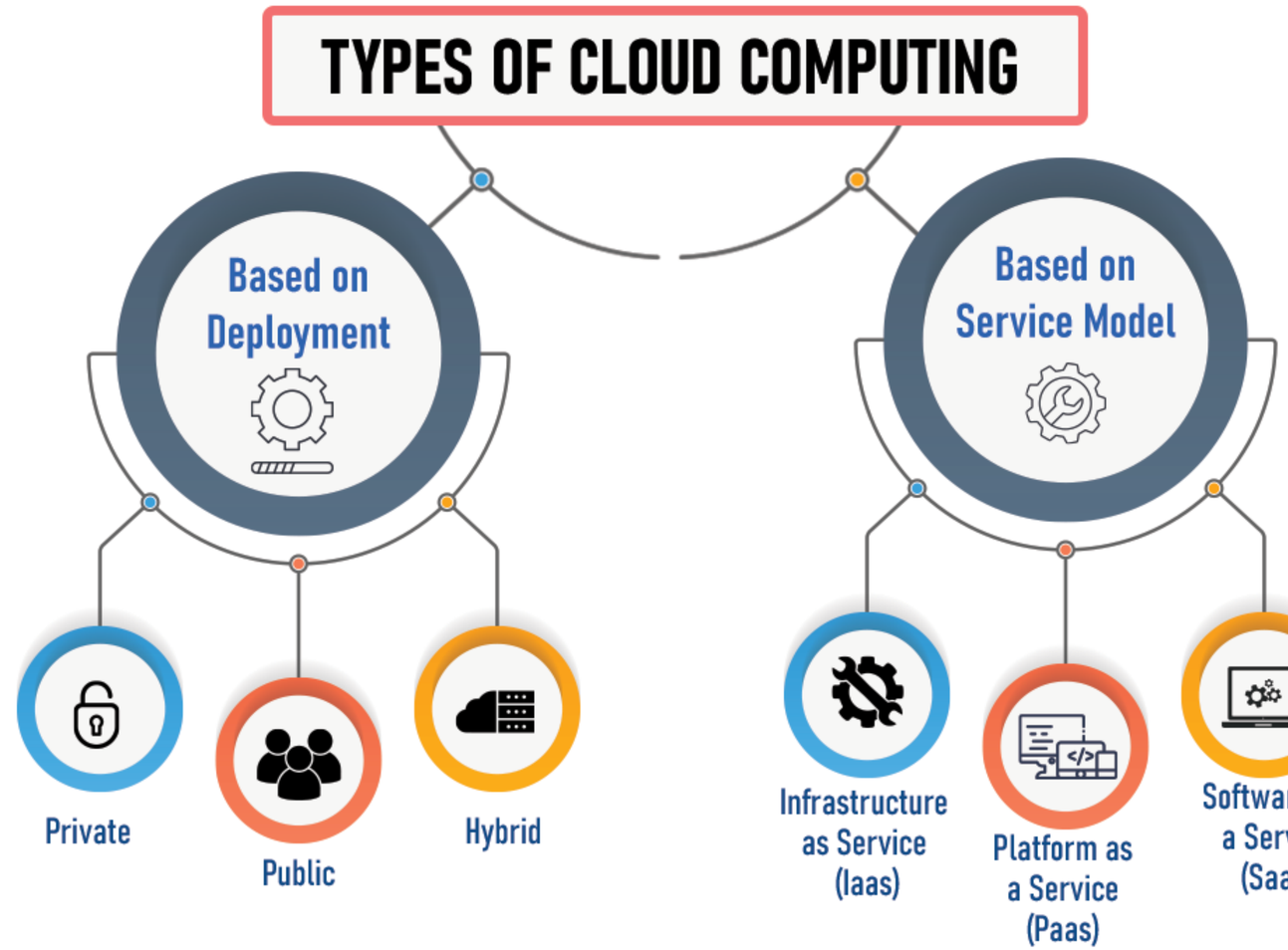
- Services offered over the public internet.

Private Cloud

- Dedicated infrastructure for a single organization.

Hybrid Cloud

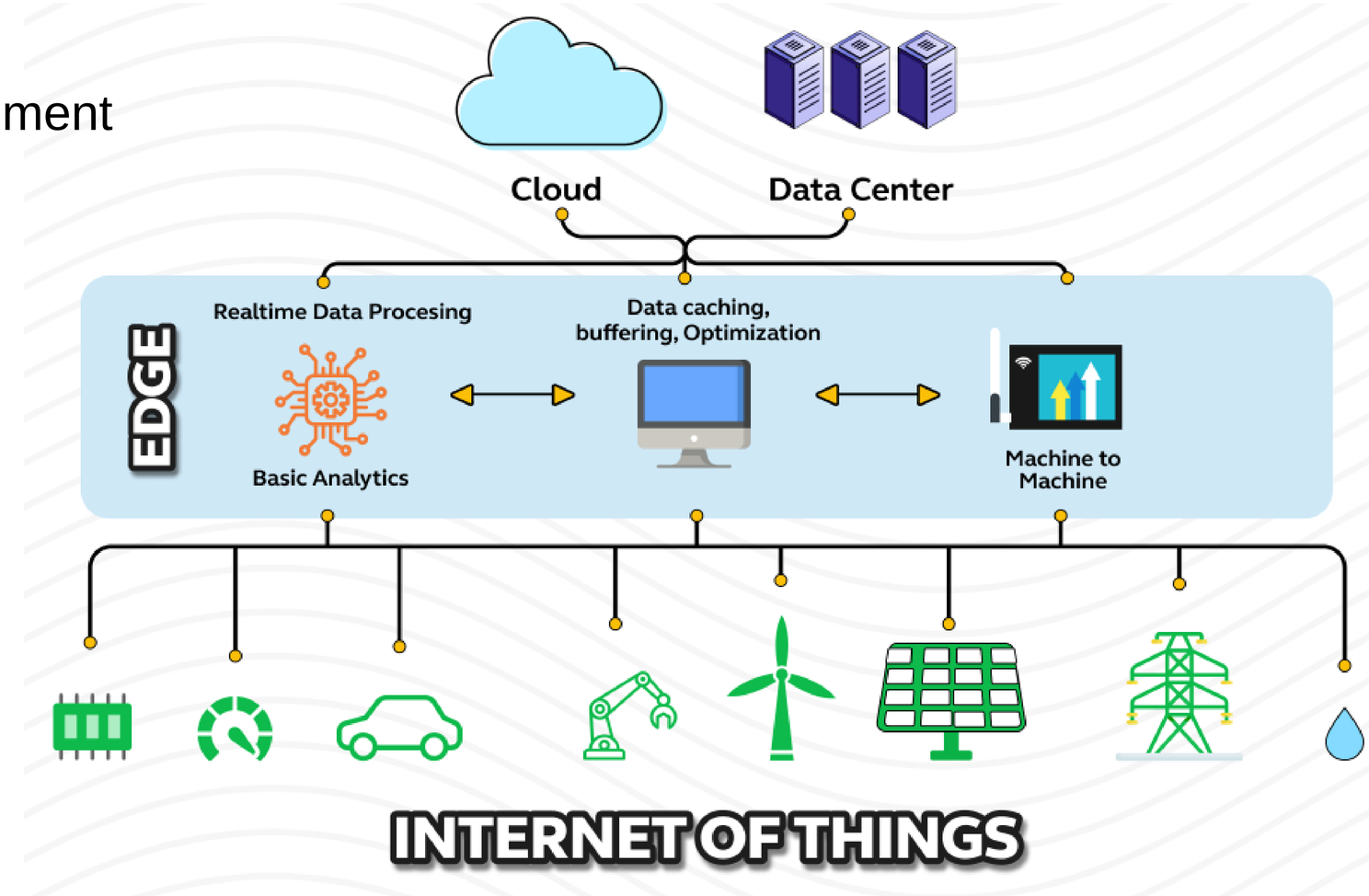
- Combination of public and private clouds.



Applications in Engineering

ELE 503: Advanced Computer Programming and Statistics

- Scalable Infrastructure for Development and Testing
- Global Collaboration Platforms
- High-Performance Computing for Simulations

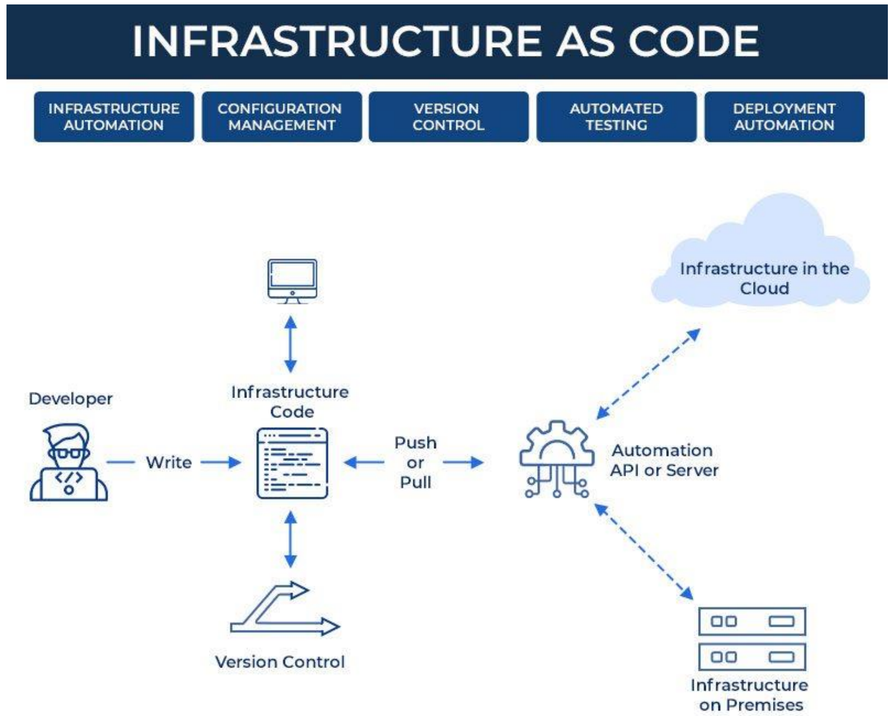


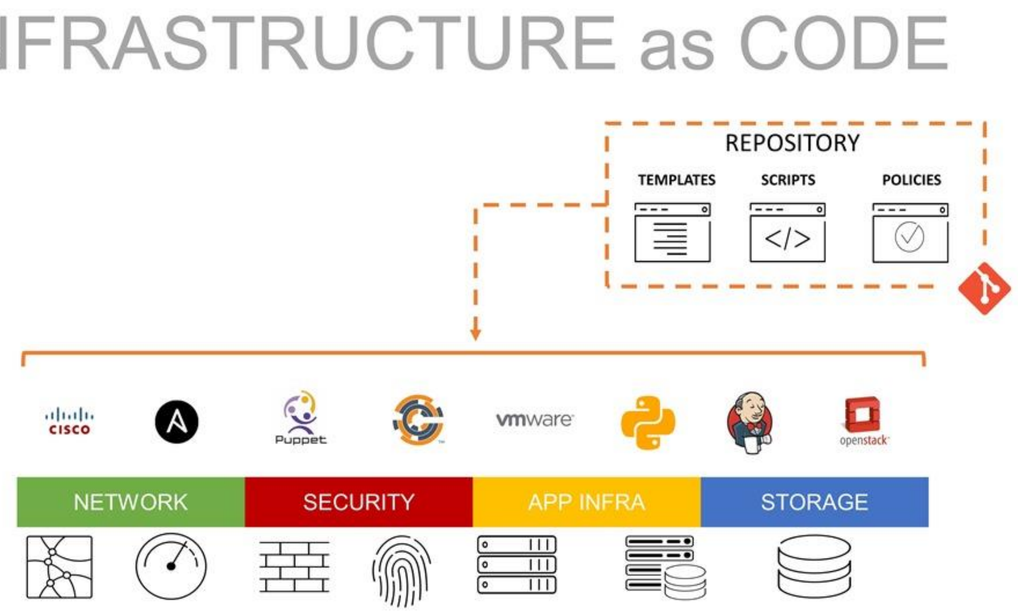
Infrastructure as Code (IaC)

ELE 503: Advanced Computer Programming and Statistics

Concept:

Managing and provisioning computing infrastructure through machine-readable definition files.





- **Benefits:**
  - Consistency
  - Version Control
  - Automation

Part 4:

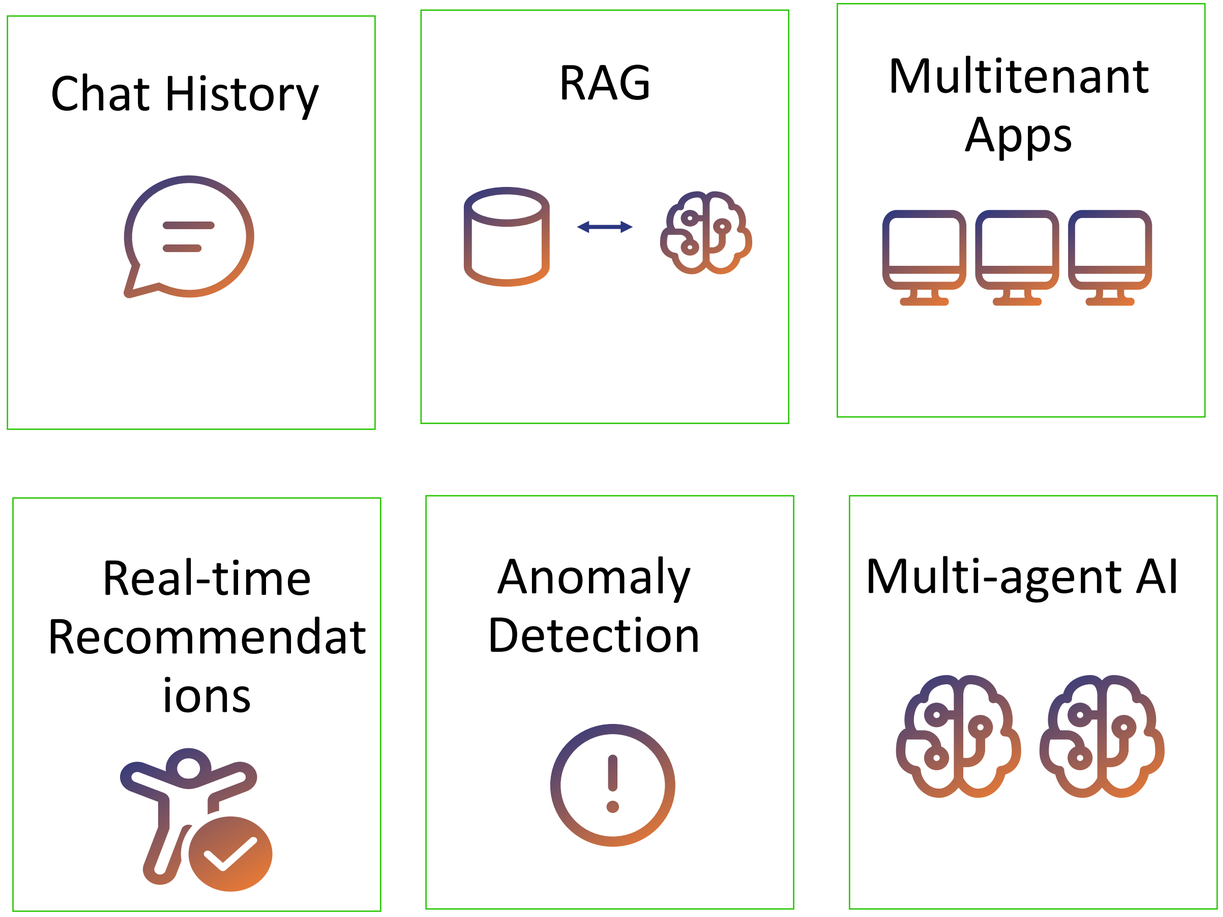
The Role of Artificial Intelligence in Software Engineering

Introduction to Artificial Intelligence (AI)

ELE 503: Advanced Computer Programming and Statistics

Definition:
AI refers to the simulation of human intelligence in machines programmed to think and learn like humans.

Branches of AI:
- Machine Learning (ML)
- Deep Learning
- Natural Language Processing (NLP)
- Computer Vision



AI in Software Development

ELE 503: Advanced Computer Programming and Statistics

Automated Code Generation:

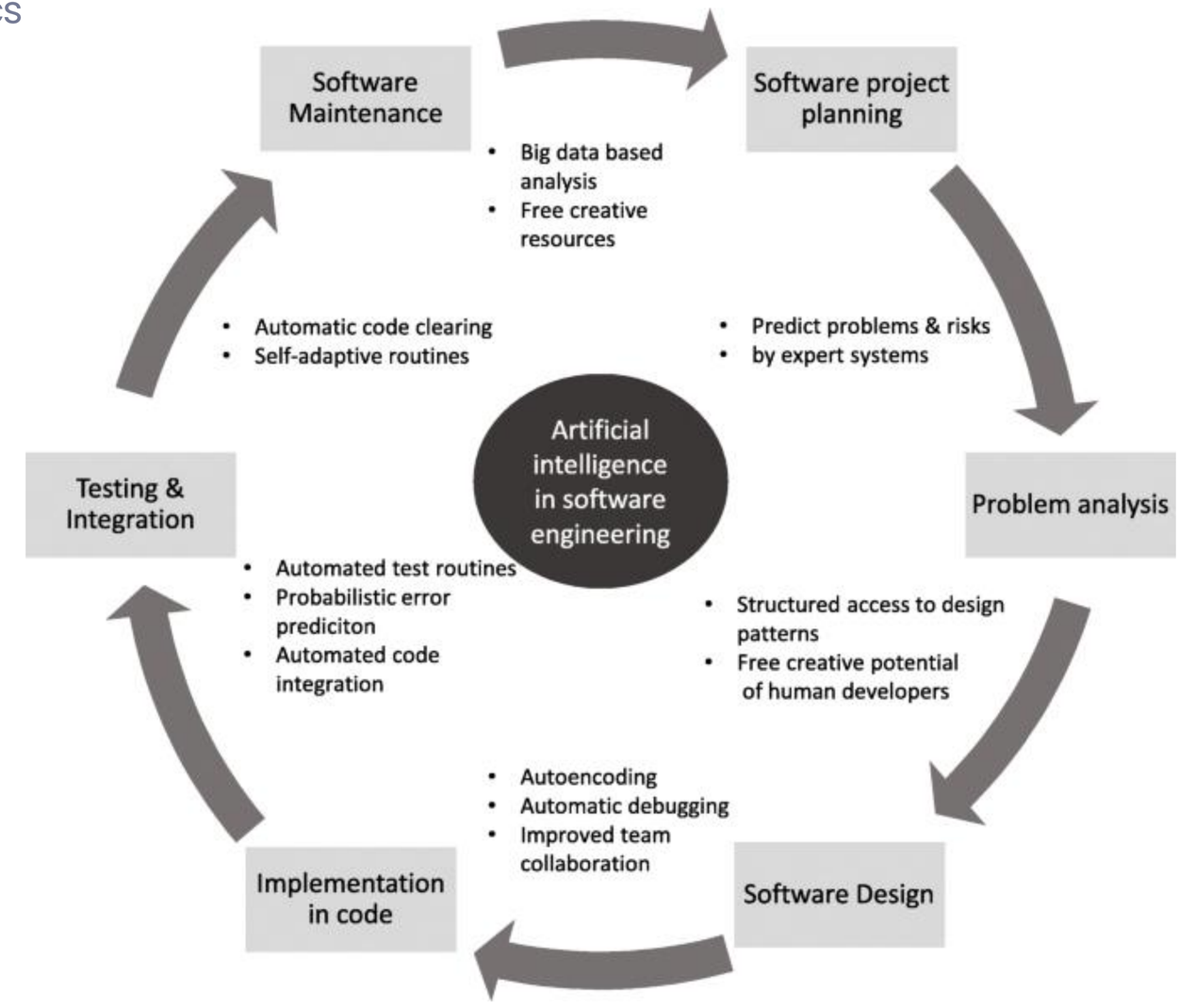
- AI-powered tools can write code based on high-level requirements.

Intelligent Testing:

- AI algorithms can generate test cases and identify potential bugs.

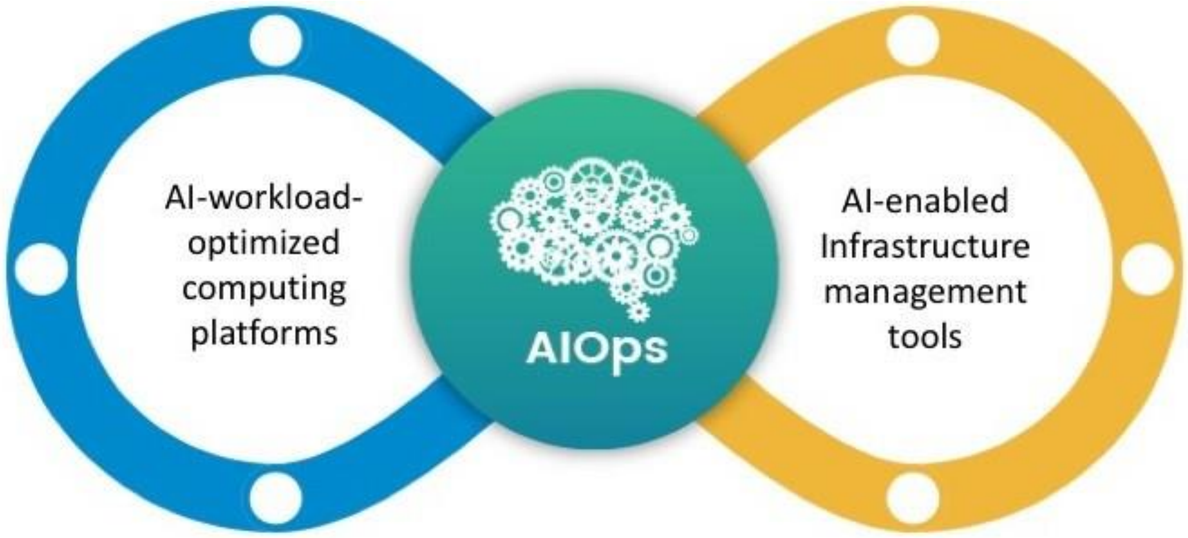
Predictive Analytics:

- Forecast project timelines and resource requirements using historical data



AI in DevOps (AIOps)

ELE 503: Advanced Computer Programming and Statistics



Enhanced Monitoring and Analytics:

- AI can analyze vast amounts of operational data to detect anomalies.

Automated Incident Response:

- AI systems can automatically resolve common issues without human intervention.

Optimizing CI/CD Pipelines:

- AI can identify bottlenecks and suggest improvements in the pipeline.

AI and Cloud Computing

ELE 503: Advanced Computer Programming and Statistics

AI-as-a-Service (AIaaS):

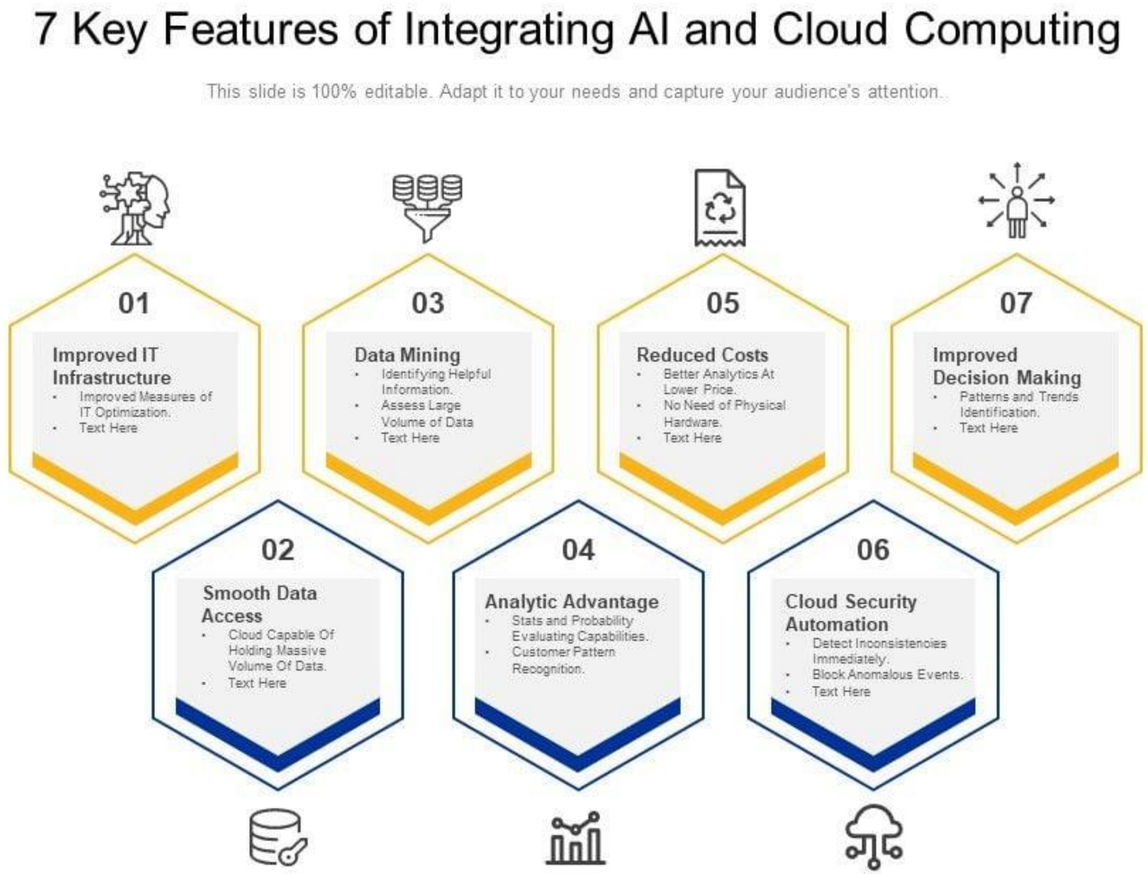
- Cloud providers offer AI services like image recognition and language translation.

Scalable AI Infrastructure:

- Cloud platforms provide the computational power required for AI workloads.

Edge AI:

- Processing data at the edge of the network to reduce latency and bandwidth usage



Ethical Considerations in AI

ELE 503: Advanced Computer Programming and Statistics

Bias and Fairness:

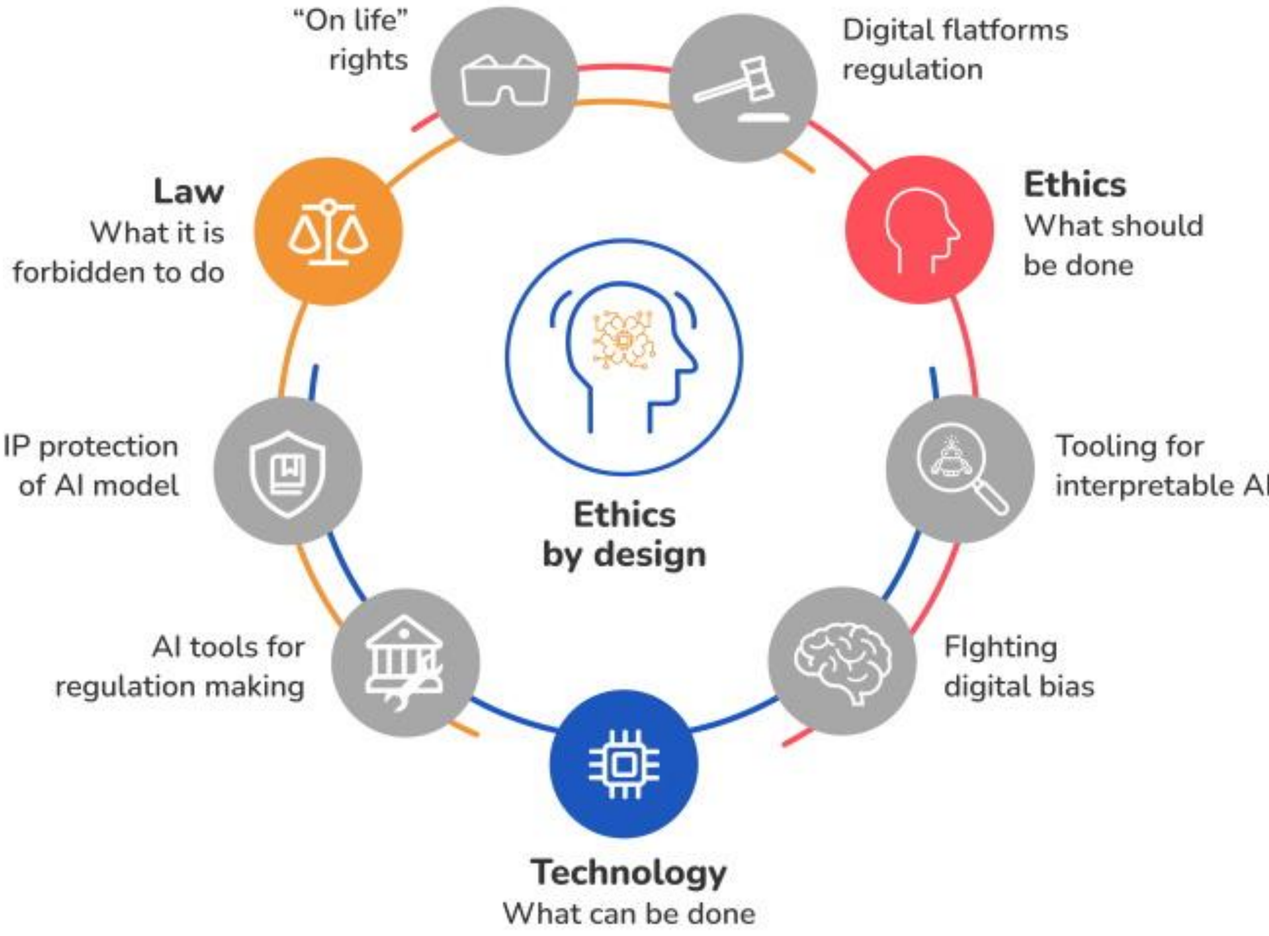
- Ensuring AI systems do not perpetuate biases present in training data.

Transparency:

- Making AI decision-making processes understandable to humans.

Privacy and Security:

- Protecting user data used in AI systems.



AI Tools and Platforms

ELE 503: Advanced Computer Programming and Statistics

AI Development Frameworks (ML):

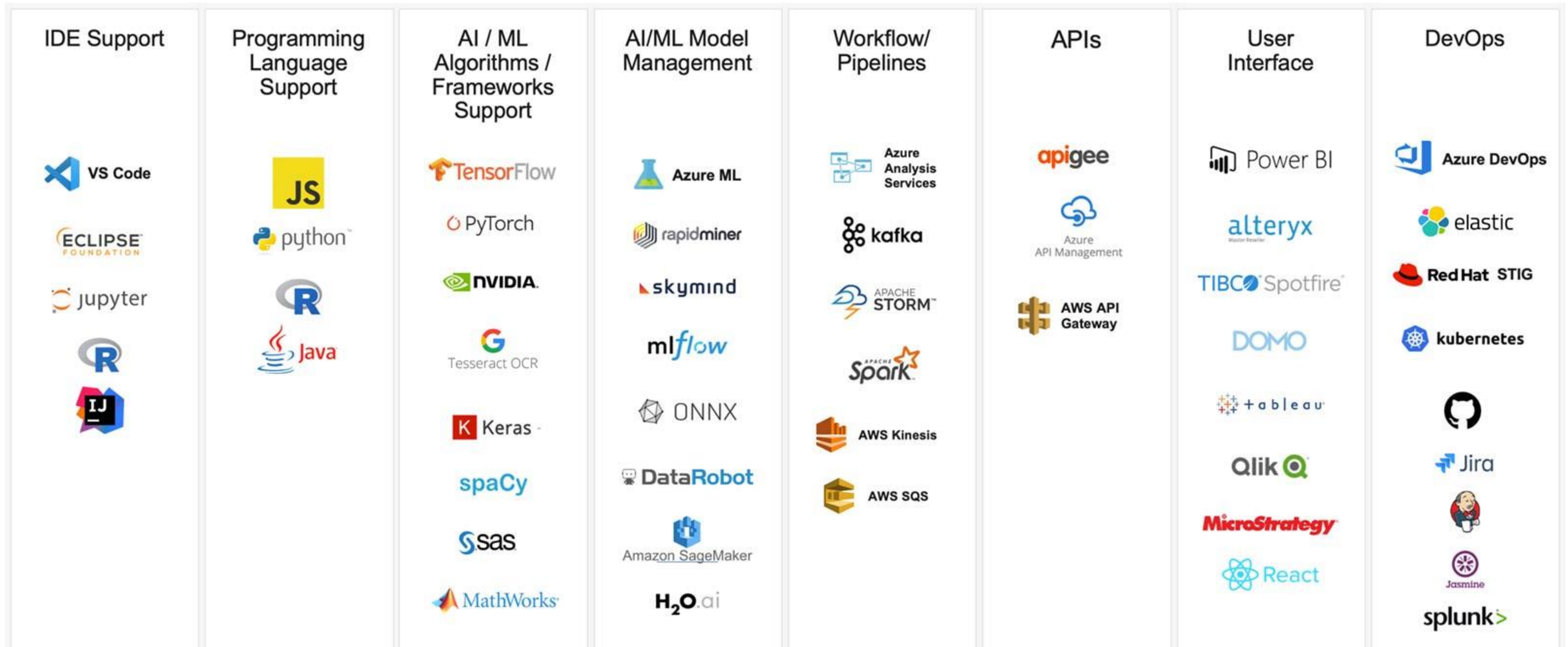
- TensorFlow, PyTorch, Scikit-learn.

AI Development Frameworks (GPT):

- Llama, OpenAI, Semantic Kernel etc.

Cloud AI Services:

- AWS AI Services, Google Cloud AI Platform, Azure AI



AI Opportunity examples

ELE 503: Advanced Computer Programming and Statistics

CALL DETAILS INVESTMENT RESULTS

The UNICEF Venture Fund is looking to invest in Open Source frontier technology solutions that have the potential to create radical change for children. We are offering up to US$100K in equity-free funding for early-stage, for-profit technology start-ups that can improve the lives of children. If your company is leveraging cutting-edge technologies such as artificial intelligence (AI), machine learning (ML), or blockchain, we want to hear from you!

We are specifically seeking companies registered in one of UNICEF's programme countries that have impressive working prototypes and a commitment to Open Source licensing and practices.

WOMEN-LED/FOUNDED STARTUPS AND YOUNG FOUNDERS ARE ENCOURAGED TO APPLY

What we're looking for?

UNICEF's Venture Fund is closely monitoring digital trends, particularly around connectivity, data integrity, and social media's impact on misinformation. The Fund aims to invest in tools, platforms, and games that help youth identify misinformation and build media literacy.

We focus on the positive potential of technologies like AI, machine learning, and big data to validate information and develop solutions that enhance digital trust. We're also exploring blockchain to secure data integrity and reduce intermediaries.

Currently, the Fund seeks companies that are leveraging AI or Blockchain software solutions to address some of our most pressing questions, which include but are not limited to:

AREA 1

Misinformation and Disinformation

*Are you creating tools, platforms or games leveraging new technologies to **verify information and combat misinformation and/or disinformation?** Or are you delivering **behavioral interventions** to consistently inform young people about **misinformation and/or disinformation?** We are particularly interested in approaches that address mis/disinformation in multiple languages and formats (e.g. audio, video, image) and encourage platforms accessible to persons with disabilities. Potential application could explore solutions such as:*

- Game-based social and behavioral change interventions or platforms to help identify mis/disinformation
- Mechanisms to review information, identify mis/disinformation, and/or provide legitimacy to true information shared online, for example software that can detect deepfakes in videos and images

AREA 3

Digital Trust

*Are you leveraging existing and new technologies to **build digital trust**? you generating insights to assess and mitigate the **threats and harms f children in digital environments**? We are seeking startups that are building new tools, for instance:*

- Decentralized protocols for content ownership, attribution, and licensing using blockchain technology
- ML/AI applications to monitor and model potential online risks to children, including those generated by AI systems
- Blockchain tor AI tools to ensure credible proof of humanity and secure "KYC" processes.
- Tools that use digital footprints from sources like social media or mobility patterns to generate insights, such as risk analyses or forecasts to trigger interventions before a crisis occurs

AREA 2

Data generation, collection and analysis

*Are you using novel approaches to **compile and validate large amounts of training data**? Or creating new data through field data collection, crowdsourcing, or social network platforms? This could include use cases such as:*

- Building safe and secure data collection and management systems following Open standards (for transparency and accountability) while anonymizing sensitive data or leveraging privacy-enhancing technologies
- Developing models to analyse large amounts of data, generate insights for decision-making and resource allocation
- Identifying methods to manage emotional or cognitive bias in data collection
- Generating new data through field data collection, crowdsourcing or social network platforms for understanding trends and conducting situational analysis

Case Study 1 - Netflix

ELE 503: Advanced Computer Programming and Statistics

Challenge:

Need for rapid deployment and scaling.

Solution:

Adopted DevOps and cloud infrastructure.

Outcome:

Improved uptime and faster feature delivery

Case Study 2 - Amazon

ELE 503: Advanced Computer Programming and Statistics

Challenge:

Managing vast IT resources efficiently..

Solution:

Implemented DevOps practices and AWS cloud services.

Outcome:

Enhanced scalability and customer satisfaction.

Case Study 3 – Google

ELE 503: Advanced Computer Programming and Statistics

Background:

- Technology company specializing in internet-related services.

AI Implementation:

- **Code Completion**: AI-powered tools like *Smart Compose* assist developers.
- **Testing**: Machine learning models predict flaky tests.

Outcomes:

- Increased developer productivity.
- Improved code quality.

Case Study 4 - IBM Watson

ELE 503: Advanced Computer Programming and Statistics

Background:

- IBM's suite of AI services.

Applications:

- **Software Development**: AI-assisted debugging and error detection.
- **Operations**: Predictive maintenance and anomaly detection.

Outcomes:

- Reduced downtime.
- Enhanced operational efficiency.

Lessons Learned from Case Studies

ELE 503: Advanced Computer Programming and Statistics

- Importance of Culture Change
- Need for Automation
- Continuous Monitoring and Feedback

Key Takeaways

ELE 503: Advanced Computer Programming and Statistics

- **Software Engineering Principles** are foundational to developing quality software.
  - They provide the guidelines for building robust, maintainable, and efficient systems.

- **DevOps** bridges the gap between development and operations, enabling faster delivery.
  - It fosters a culture of collaboration and continuous improvement.

- **Cloud Computing and IT Infrastructure** are critical enablers for modern engineering applications.
  - They offer scalability, flexibility, and cost-efficiency.

- **Artificial Intelligence (AI)** is transforming software engineering and operations.
  - AI introduces automation and intelligence, enhancing productivity and innovatio