

# Research Project Initial Plan

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## Basic Overview: Research Question and Method

### Research Question:

The main question for this research is: **"How does PyTorch, as a deep learning library, use object-oriented programming (OOP) concepts, and how does this compare to TensorFlow?"**

This question looks at how key OOP principles (classes, inheritance, abstraction, etc.) are used in PyTorch and how they affect the library's design and functionality compared to TensorFlow.

### Research Method:

To answer this question, the following steps will be used:

1. **Reading Existing Information:** I will review PyTorch's official documentation, research papers, and resources from the developer community to understand how OOP is applied in the library.
2. **Studying the Code:** I will analyze PyTorch's source code (available on GitHub) to see how OOP ideas like classes and inheritance are used in building its modules and functionalities.
3. **Practical Examples:** I will create simple examples and projects to demonstrate how these OOP principles work in PyTorch and test the findings.
4. **Comparing with TensorFlow:** I will compare PyTorch with TensorFlow, another popular deep learning library, to see how both use OOP ideas and what differences or similarities exist between them.

This approach will help me understand how PyTorch is designed and how it uses OOP to be flexible and easy to use, while comparing it to another major framework.

My research project directly relates to several of the unit's learning outcomes:

1. **Explaining OOP principles:** In my project, I explore key OOP concepts like **abstraction, encapsulation, inheritance, and polymorphism** by looking at how PyTorch uses them. This helps me understand and explain these principles, which aligns with the first learning outcome.
2. **Using an OOP language:** I'm using Python, an object-oriented language, to explore how PyTorch works. By creating examples and experimenting with code, I meet the second outcome of using an OOP language to develop programs.
3. **Communicating structure and behavior:** I will describe and possibly create diagrams to explain how PyTorch's classes and modules work, which connects with the fourth outcome of clearly communicating how OOP structures and behaviors work.