Synopsis of Project

Project Title: *AI Researcher – Intelligent Research Paper Summarization and Gap Detection Tool*

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1. Introduction

Research has become an integral part of academic and professional development. However, with the vast amount of research papers published daily, students and researchers face challenges such as information overload, difficulty in identifying relevant studies, and limited time to read lengthy documents.

The **AI Researcher** project aims to provide an intelligent, user-friendly solution for simplifying research. The system allows users to upload research papers (PDF) or search for a topic, and then automatically generates summaries, identifies research gaps, classifies papers into qualitative/quantitative types, and exports results into a structured, branded PDF format.

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2. Objectives

- To design a system that assists users in **summarizing research papers** quickly.
- To implement **research gap detection** using AI models.
- To provide **classification** of studies into qualitative and quantitative categories.
- To create a **user-friendly web interface** accessible to non-technical users.
- To allow exporting of results into **professional PDF reports** with branding.

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3. Features

1. **PDF Upload & Analysis** – Extract text, metadata (title, pages, words, reading time).

2. **Automated Summarization** – AI-generated concise summaries of single or multiple papers.
3. **Research Gap Detection** – Identify unexplored areas and potential future research.
4. **Classification** – Categorize papers as qualitative or quantitative.
5. **Sources & Metadata** – Display structured details (title, type, category, publish date, page count).
6. **Export to PDF** – Generate professional reports with branding ("DexterityCoder").
7. **Cache Management** – Avoid repeated processing of the same paper/topic.
8. **User Interface** – Clean, responsive web app built with Flask, TailwindCSS, and HTMX.

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4. Tools & Technologies

- **Backend**: Python (Flask Framework)
- **Frontend**: TailwindCSS, HTMX
- **AI Models/APIs**: HuggingFace Transformers (T5/BART/DistilBERT) or external AI APIs
- **PDF Handling**: PyPDF2 / pdfplumber (extraction), ReportLab (export)
- **Database/Cache**: In-memory dictionary or SQLite
- **Deployment**: Localhost / Cloud hosting (Heroku/Render)

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5. Scope

The project will demonstrate **integration of AI with software engineering** principles. It is intended as a tool for **students, researchers, and academicians** to speed up literature review and research planning.

Future Enhancements:

- Integration with online repositories (Google Scholar, ArXiv).
- Multi-language summarization.
- Citation analysis and reference extraction.

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6. Expected Outcomes

- A functional web application that can upload and analyze research papers.
- Automated generation of summaries, gaps, and classifications.
- Exportable PDF reports for easy reference.
- A practical system demonstrating **real-world AI application** in research.

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7. Conclusion

The **AI Researcher** project is an innovative solution that bridges the gap between AI models and real-world usability. While AI performs the heavy processing, the contribution of this project lies in **workflow design, integration, user-friendly interface, and structured output**. This makes it an impactful and suitable project for the BCA final year.