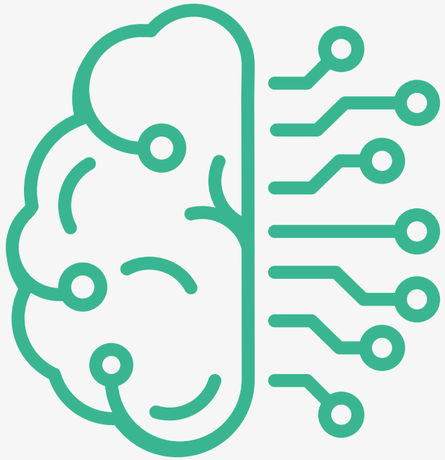
BACHELOR THESIS



FINWIKI

A FINANCIAL SEARCH ENGINE

BACHELOR THESIS

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BACHELOR THESIS

PROJECT INFORMATION

Author: **Raphael Keisler**
Supervisor: **Univ.Prof. Mag.Dr.rer.soc.oec. Rony Flatscher**

Dev.-Period: Jul. 25 - Nov. 25
Writing-Period: Dec. 25 - Mar. 26

Intended Degree: Bachelor of Science (WU), BSc (WU)

Side Facts:

- Research Project
- WrittenWeekly Status Report
- Version management
- API provider collaborations
- Author's freedom of choice

BACHELOR THESIS



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BACHELOR
THESIS

DO YOU INVEST?

BACHELOR THESIS

DO YOU DAILY CHECK AND ADJUST YOUR PORTFOLIO?

BACHELOR THESIS

DO YOU KNOW THE DIFFERENCE BETWEEN MARKET ORDER AND LIMIT ORDER?

DO YOU KNOW ABOUT ORDER FEES, TRADER FEES, COMMISSIONS OR SPREADS?

DO YOU KNOW ABOUT THE TAX REGULATIONS FOR INVESTMENTS?

PROBLEM STATEMENT

INCREASING COMPLEXITY

- Wide range of assets (stocks, ETFs, crypto, derivatives)
- Different risk-return profiles
- Increasing market volatility (macro, geopolitics)
- Regulatory requirements and market mechanisms

MISSING FINANCIAL KNOWLEDGE

- Lack of understanding of risk and diversification
- Uncertainty in portfolio construction
- Reliance on social media / unvalidated sources
- Misinterpretation of financial ratios
- Formal education in finance

LACK OF TIME

- Continuous market monitoring is necessary.
- High information processing effort is required.
- Rapid market movements require rapid reactions.
- Information overload leads to decision paralysis.

LIMITATION OF EXISTING SOLUTIONS

INCREASING COMPLEXITY	**EXPENSIVE ADVISORS**	• High minimum investment amounts required • Fee models (commissions, management fees) • Often only economically viable for wealthy clients • Conflicts of interest due to commission-based advice
MISSING FINANCIAL KNOWLEDGE	**STANDARDIZED MODELS**	• Limited portfolio customization • Limited consideration of personal circumstances • Rigid strategies despite dynamic markets • Focus on scalability rather than personalization
LACK OF TIME	**NO DECISION TRANSPARENCY**	• Unclear decision-making logic ("black box") • Customers often don't understand recommendations • Trust suffers due to lack of explainability • Little insight into data sources and models

BACHELOR THESIS

SURVEY

- 60 Participants
- 50% female / 50% male
- Ages between 17 and 65 years
- Conducted in German Language

Demographic additions

- Most Participants are 30+ years old
- Most Participants have a fulltime job
- Most Participants live in a rented apartment
- Most Participants have no kids

GOAL

- Analysis of private users' investment behavior
- Identification of problems and uncertainties
- Understanding expectations of digital tools
- Basis for system design

METHODOLOGY

- Online questionnaire (anonymous)
- Exploratory study (not representative)
- Focus on qualitative insights

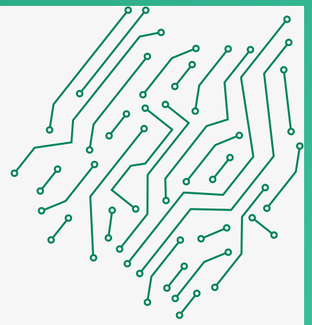
MAIN CONTENT AREAS

- Financial situation & Investment experience
- Risk tolerance
- Expectations of recommendation systems

BACHELOR THESIS

SURVEY: FINANCIAL INSIGHTS

- About 2060 EUR net income / month
- About 1040 EUR fix expenditures
- About 10% think they have huge financial problems



- Only one person is against investing his money

- About 40% have no money invested
- About 75% want to invest
- About 70% want to have a monthly savings plan

- About 40% think the entry point is too difficult
- About 85% don't know in what to invest
- About 80% don't know if they invested their money correctly

- About 90% of the participants which have no money invested don't know how to start
- About 60% of the participants which have no money invested think it too time consuming to deal with this topic

- About 60% would invest if they have an personalized portfolio recommendation
- About 45% would pay for an automatic personalized portfolio recommendation

BACHELOR THESIS

SURVEY: FINANCIAL INSIGHTS

- About 2060 EUR net income / month
- About 1040 EUR fix expenditures
- About 10% think they have huge financial problems

About 75% of the people selected the option to get an test access should a product result from this research.

Feedback of the 40% who do not have money invested why they don't invest:

(Free Text Answers - Translated from German to English)

"I'm not investing because I don't know enough about it and it's too complicated for me. I'm afraid of losing money."

"Because I know far too little about it."

"I don't invest because there's too little interest in dealing with it. With the amounts I have available, the fees and taxes are probably too high. (...)"

"Don't know how"

"Too high risk"

"I only invest a little because I don't know enough and don't know where to start. Hardly anyone around me is doing it, and it's very difficult to make progress in this area. (...)"

BACHELOR THESIS

RESEARCH QUESTION

TO WHAT EXTENT ARE MODERN AI MODELS SUITABLE FOR SUPPORTING OR AUTOMATING FINANCIAL ANALYSIS AND INVESTMENT-RELATED DECISION-MAKING AND WHAT TECHNICAL AND CONCEPTUAL LIMITATIONS ARISE IN THIS CONTEXT?

BACHELOR THESIS

THESIS TIMELINE

THEORETICAL DEEPENING

SCOPE DEFINITION

EMPIRICAL SURVEY

DEVELOPMENT

DRAW UP

DOCUMENTATION

MAINLY PRACTICAL-ORIENTED THESIS

BACHELOR THESIS

THE IDEA(S)

A FINANCIAL SEARCH ENGINE

An interactive analysis tool that allows users to **search and evaluate financial assets** in a structured way. The system combines quantitative market data with qualitative context from financial news to create a transparent and comprehensible basis for decision-making, without forcing specific action recommendations.

- **ASSET SEARCH & IDENTIFICATION**
- **INTEGRATION OF MARKET DATA**
- **NEWS ANALYSIS & SENTIMENT SCORING**
- **TRANSPARENT SCORING SYSTEM**

“THE GOOGLE FOR ASSETS”

BACHELOR THESIS

THE IDEA(S)

A FINANCIAL SEARCH ENGINE

ASSET SEARCH & IDENTIFICATION

- Search for assets by name or ticker symbol
- Mapping to unique identifiers (ISIN)
- Real-time suggestions for improving usability

NEWS ANALYSIS & SENTIMENT SCORING

- Aggregation of financial news from APIs
- Filtering by relevance and recency
- Evaluation of sentiment and events
- Time weighting (more recent news is given greater weight)

TRANSPARENT SCORING-SYSTEM

- Combination of quantitative and qualitative factors
- Multidimensional evaluation (e.g., market + news)
- Transparent score calculation
- No "black box" model

INTEGRATION OF MARKET DATA

- Retrieval of price trends and volumes
- Historical time series analysis
- Data normalization and validation
- Comparability between assets

BACHELOR THESIS

THE IDEA(S)

DIGITAL FINANCE ADVISOR

A conceptual approach for a **personalized financial advisory system** that processes individual user data to generate structured investment insights. The focus is not on automating decisions, but on supporting the user through explainable and context-related analyses.

- **SURVEY BASED PERSONALIZATION**
- **USER BASED PREFERENCE PREDICTION**
- **PERSONALIZED ANALYZATION**
- **AI SUPPORTED INTERPRETATIONS**
- **DASHBOARD BASED VISUALIZATION**
- **PORTFOLIO RECOMMENDATION**
- **AI BASED SELF CONTROL MECHANISMS**

PRODUCT RESEARCH

The broader goal was to see if a future product could be developed from it.

BACHELOR THESIS

THE IDEA(S)

DIGITAL FINANCE ADVISOR

USER BASED PREF. PREDICTION

- Assessment of risk profile and financial situation
- Consideration of individual goals
- Integration of personal constraints
- Structured questionnaires

AI SUPPORTED INTERPRETATIONS

- Analysis of news and market information
- Generation of structured insights
- Support for complex decisions
- Use of LLMs as an analysis tool

DASHBOARD BASED VISUALIZATION

- Clear presentation of all information
- Combination of multiple data sources in one view
- Interactive components for user control
- Focus on comprehensibility and transparency

PERSONALIZED ANALYZATION

- Combination of user data and market data
- Context-dependent valuation of assets
- Adaptation to individual risk tolerance
- Dynamic interpretation of information

BACHELOR THESIS

SURVEY: FINANCIAL ADVISOR TOOL

- Full Transparency
- Full Explanation
- Recommendation instead of Automation

Question about most important Part of an Financial Advisor Tool

(Free Text Answers - Translated from German to English)

“Security”

“A lot of explanations”

“Security, Explanation, Transparency”

“Independency of Advisor how much Money I make with my investments”

“Personalization & Explanation”

BACHELOR THESIS

TECHNICAL SPECIFICATIONS

Frontend
- HTML / CSS / JAVASCRIPT
- Webbased

Backend
- Python
- Local LLMs
- FastAPI

Data & API
- ISIN Broker Directories
- Search API (News)
- yFinance

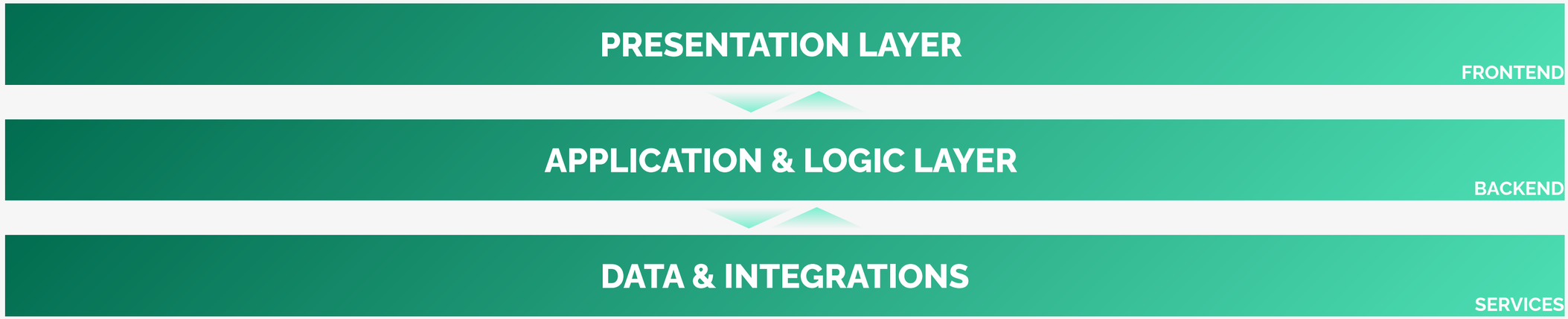
PROTOTYPE BASED APPROACH
- Focus on functional implementation rather than perfection
- Rapid iteration and testing
- Validation of concepts

CONSCIOUSLY FAULT TOLERANCE
- Bugs, Defects and inconsistencies allowed
- Priority: Functionality

MAIN OBJECTIVE
- Development of a functional prototype
- Evaluation of technical feasibility
- Analysis of AI suitability in a financial context
- Basis for economic evaluation

BACHELOR THESIS

SYSTEM ARCHITECTURE



BACHELOR THESIS

PRESENTATION LAYER (FRONTEND)

The implemented frontend includes **asset overview panels**, **time-series visualizations, summaries of key financial indicators**, as well as **sentiment and scoring visualizations** derived from data analysis. **Predefined UI components (dashboards, styling, e.g.)** were used.

DESIGN PHILOSOPHY

- ·Simplicity over Complexity
- Visual clarity over information Density
- Intuitive Navigation
- Immediate feedback for user Actions

PRIMARY INTERACTION MODES

- Exploratory Mode (Search Engine)
- Advisory Mode (Personalized Dashboard)

BACHELOR THESIS

APPLICATION & LOGIC LAYER (BACKEND)

Central control unit of the system responsible for coordinating all core processing tasks. Its primary role is to **manage data flow between system components, execute business logic, perform data transformations and interface** with both external services and internal AI components.

INTERNAL API ARCHITECTURE

- Local private Server ensures Communication via **internal API**
- Frontend and Service Layer communicate over internal Calls to the Server **(Request-Response-Model)**
- Easy-Handle via Primary Identicator E.g. ISIN within API Calls as first endpoint. (.../ISIN/stock_informations)

INCL. REGULAR LOGIC TASKS

- SCORE CALCULATIONS
- DATA ANALYZATION
- LLM VALIDATION
- ...

BACHELOR THESIS

DATA & INTEGRATIONS (SERVICES)

Reliable financial analysis depends on consistent access to high-quality data. The system therefore integrates **structured market information and unstructured news content**, both of which require dedicated acquisition and **preprocessing mechanisms** to ensure stability and analytical relevance

SYSTEM RELIES ON PUBLICLY ACCESSIBLE DATA SOURCES

DATA ACQUISITION

- News Articles (ov. News API)
- Realtime Market Data (ov. Yahoo Finance API)
- Asset Reference Data (ISIN, Symbol, ...)

DATA PREPROCESSING MECHANISMS

- Normalization of Data Records
- Asset Identification Mapping (Symbol / ISIN Map)
- Time synchronization of data

BACHELOR THESIS

QUANTITATIVE SCORING APPROACH

Quantitative scoring is based on technical and fundamental financial data retrieved via external APIs (e.g., yFinance) and transformed into standardized scores using deterministic functions.

1 TECHNICAL INDICATORS

- Money Flow Index
  - Combination of Price & Volume
  - Measures Buy/Sell Pressure
- On-Balance Volume
  - Cumulative volume
  - Trend confirmation
- Relative Volume
  - Current volume vs. Average
  - Indicator of market activity

2 MARKET SENTIMENT

- Short Interest (stimulated)
  - Indicator of negative expectations
- Earnings Revisions
  - Expectations of future performance

3 FUNDAMENTAL INDICATORS

- Profit Margins (Cost Structure)
- Return on Assets (Return Profile)

4 NORMALIZATION & SCORING

- Scaling of all values
  - Between 0-100
- Comparability
  - Between Assets
- Partially inverse valuation
  - e.g. Risk Indicators

BACHELOR THESIS

QUALITATIVE SCORING APPROACH

Qualitative scoring analyzes financial news using a rule-based model that combines sentiment, relevance, and events to assess the impact of news on an asset.

Initially planned to use AI assessments, but converted to model evaluations due to limitations.
Unlike LLM-based approaches, this model ensures consistency and transparency through rule-based scoring.

1 SENTIMENT ANALYSIS

- Use of positive & negative keywords
- Weighting through language patterns

Rating:
Strong statements → higher
Uncertain statements → lower

2 RELEVANCE SCORING

- How often is the company mentioned?
- Context of the mention

3 EVENT / TOPIC DETECTION

- Detection of important events:
  - Earnings Beat
  - M&A
  - Scandals
- Predefined weighting

4 CONTEXTUAL WEIGHTING

- Time weighting
  - Current news is more important
- Source weighting
  - e.g. Bloomberg > smaller sources

BACHELOR THESIS

INITIAL AI APPROACH

SEARCH ENGINE

NEWS SCORING

- Analysis of unstructured financial news
- Sentiment detection
- Identification of relevant events
- Assessment of relevance and impact on the asset
- Integration into an overall scoring system

DIGITAL FINANCE ADVISOR

PERSONALIZED INVEST-PROFILE

- Analysis of user responses from the survey
- Derivation of:
  - Risk tolerance
  - Investment goals
  - Financial situation
- Creation of an individual investment profile

PORTFOLIO CREATION

- Derivation of suitable assets based on the profile
- Consideration of:
  - Risk
  - Diversification
  - Market conditions
- Generation of an initial portfolio

RISK PROFILE CREATION

- Adapting the risk profile based on user behavior
- Considering real-world decisions
- Continuous learning from user actions
- Improving future recommendations

BACHELOR THESIS

TROUBLES WITH AI

➜ LACK OF CONSISTENCY

- Same inputs - different outputs
- Results not consistently reproducible
- Problem for comparable assessments

➜ MISSING DETERMINISM

- Results not precisely controllable
- Difficult integration into a structured system
- Especially in Software Development Environments

➜ LACK OF TRANSPARENCY

- Decision-making logic incomprehensible
- No clear justification for evaluations
- Problematic for trust and transparency

➜ HALLUZINATION

- Missing inputs lead to halluzination
- Dangerous in finance market
- Free Text Questions in Survey

➜ NOT SUITABLE FOR SOFTWARE DEVELOPMENT

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EXAMPLE: PERSONALIZED INVESTMENT PROFILE CREATION

GOAL

An investment profile should be created based on survey results

AI INPUT

JSON Document with highly specified prompt to create a investment profile. The Profile should be documented within a new JSON Document
**All fields are of course defined in prompt*

EXPECTED OUTCOME

JSON Document including the investment profile

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EXAMPLE: PERSONALIZED INVESTMENT PROFILE CREATION

REAL OUTCOME

OPTION A
Correct investment profile in incorrect file format

OPTION B
Incorrect investment profile in correct format

ATTEMPTED SOLUTIONS

- Simpler Input / Output Format
- LLM Output Control
- Repetition Loops

CONCLUSION

AI is not capable of solving two requirements in one output

BACHELOR THESIS

KEY RESULTS

Evaluation of the system highlights the strengths and limitations of combining data-driven models and AI in finance

1 AI AS A SUPPORT TOOL

- Ideal for:
  - Processing unstructured data (news)
  - Identifying trends and patterns
- Helpful in **supporting human analysis**

2 NOT SUITABLE FOR FULL AUTOMATION

- Insufficient reproducibility
- Lack of stability for consistent decisions
- Problematic as the sole decision-making authority

3 STRENGTH OF STATIC MODELS

- Stable and comparable results
- Clear integration into scoring systems
- High transparency and traceability

4 HYBRID APPROACH AS BEST SOLUTION

- Combination of:
  - structured data (quantitative)
  - rule-based logic
  - optional AI support

**VIBE CODING IS CHANGING A LOT AT THE MOMENT*

BACHELOR THESIS

AI IS NOT A REPLACEMENT
IT IS A SUPPORT TOOL

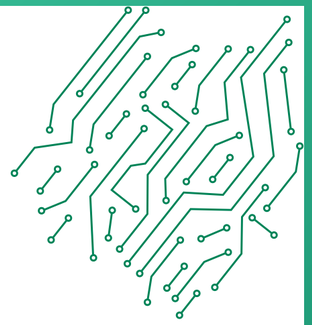
AI AS REPLACEMENT

INCONSISTENT RESULTS
LACK OF TRACEABILITY
NO COMPLETE CONTROL
UNSUITABLE FOR CRITICAL DECISIONS

AI AS SUPPORT TOOL

ANALYSIS OF UNSTRUCTURED DATA (E.G., NEWS)
SUPPLEMENTING HUMAN DECISION-MAKING
SUPPORTING INFORMATION PROCESSING
IMPROVING EFFICIENCY

OUTLOOK



TECHNOLOGICAL PROGRESS

- **Faster AI Development Cycle**
  - Significant progress within a few months
  - Improved models (stability, context understanding)
  - Higher quality text analysis
- **Rise of “Vibe Coding”**
  - AI-powered development is becoming increasingly prevalent.
  - Faster prototype development is possible.
  - Reduced technical barriers to entry.

FUTURE ROLE OF AI IN FINANCE

- **Domain-Specific Models**
  - Specialized models for finance
  - Higher accuracy and consistency
- **Hybrid Systems**
  - Deterministic models
  - AI components
  - AI as a complement, not as the core

FINANCIAL ADVISORY DASHBOARD

The survey results clearly indicate that there is **demand for tools that support investment decisions**. However, the current concept may be too complex in its full scope. Therefore, future development should focus on simpler, more targeted solutions. I am currently continuing the project with this in mind.

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THANK YOU!

Feel free to ask questions

Raphael Keisler