UNICORN UNIVERSITY

Diploma Thesis Defense

Cashless festival data analysis and analytical dashboard development

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Supervisor: Mgr. Václav Alt, Ph.D.

Opponent: Ing. Hana Flusková

03.02.2025

Outline

- Introduction
- Thesis Objectives
- Methodology
- Results
- Conclusion
- Questions from Reviews

Introduction

Context

Challenge and Problems

Background and Motivation

Introduction

Context

Challenge and Problems

Background and Motivation

- Traditional cash payments
  - Hard to manage and control
  - No data insights, unreliable reporting
- Shift to **cashless solutions** in the last decade

- **NFCtron** – a full-scope cashless payment solution for events and festivals:
  - Online ticket sales & top-ups
  - On-site payments & access control
  - Real-time analytics & reporting

Introduction

Context

Challenge and Problems

Background and Motivation

- P1: NFCtron Hub Analytics include some basic metrics and more unstructured data
  - **unused potential of the data**
- P2: The organizers are not data scientists
  - **require simple and easy way to present**
- P3: There is a lot of data that’s not being used
  - **find its analytical value, improve the system**

Introduction

Context

Challenge and Problems

Background and Motivation

- Chief Product Officer at NFCtron
  - Responsible for product development
  - Deep system knowledge, access to the data
- Vision
  - Enhance NFCtron Hub analytics
  - Provide insights that the organizers want
  - Enable data-driven decisions

- **⇒ transform data into valuable insights for organizers**

Thesis Objectives

Research Questions

Requirements

Thesis Objectives

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Research Questions

Requirements

Thesis Objectives

- Cooperation with a business client (organizer) at an undisclosed 3-day festival in 2024
- Research questions defined based on the organizer needs
- Total of **29 research questions** in 4 key areas:
  - Cashflow and Revenue Sources
  - Performance Indicators
  - Beverage Consumption
  - Customer Analysis

Thesis Objectives

Research Questions

Requirements

Thesis Objectives

Data privacy

- Anonymize sensitive data
- Protect vendor information
- Secure customer details

Client (organizer) needs

- Keep event details undisclosed
- Provide **clear visualizations**

Thesis Objectives

Research Questions

Requirements

Thesis Objectives

Data Analysis

- Prepare, process and **analyze available data** from the festival
- **Find answers** to all 29 research questions
- Present **clear results** to the research questions

Dashboard Prototype

- Implement a simple **internal dashboard prototype** to demonstrate the findings
- Focus on key metrics and real data visualization

Methodology

Data Collection

Data Preperation

Data Enhancement

Data Anonymization

Tools and Technologies

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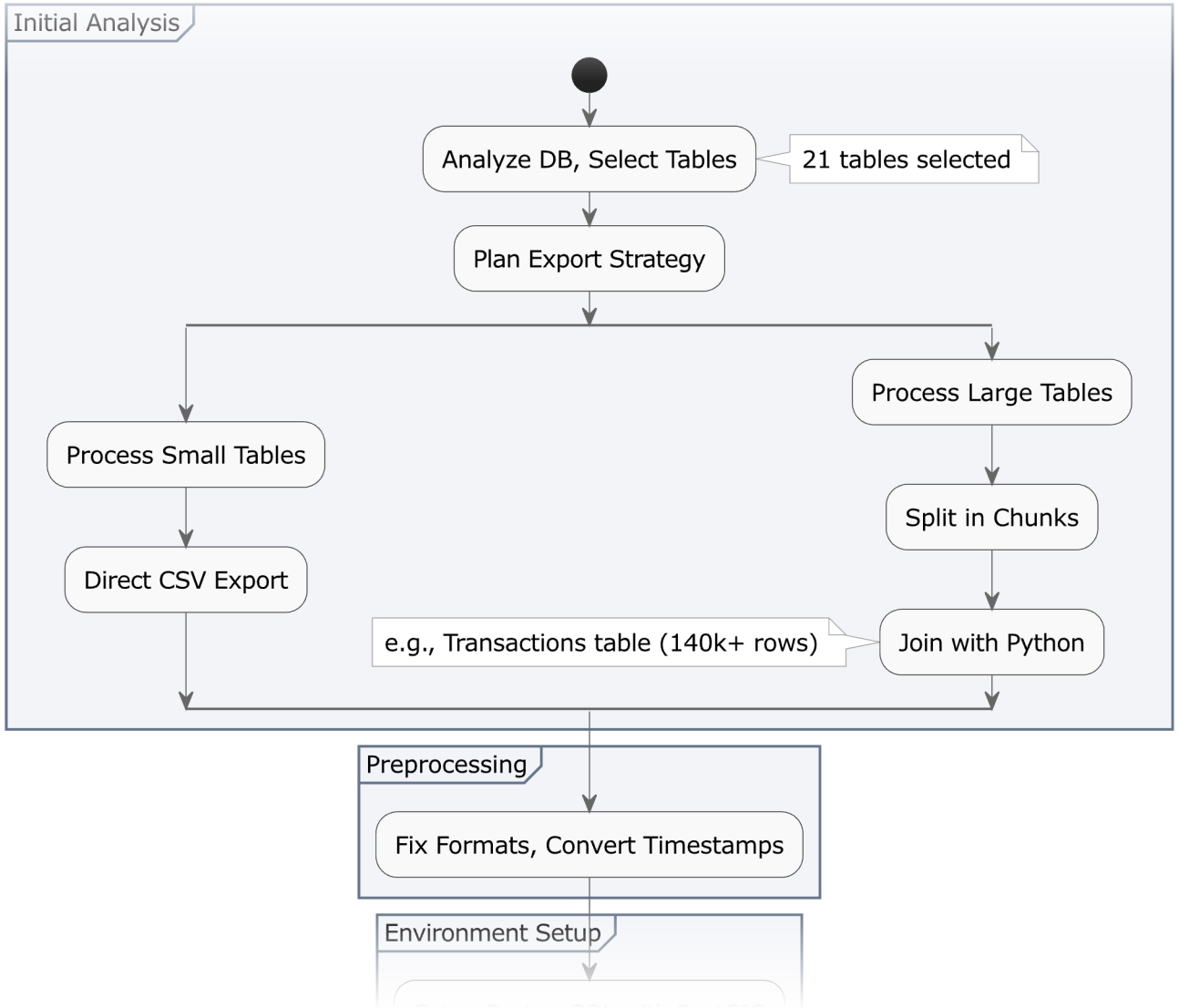
Data Anonymization

Tools and Technologies



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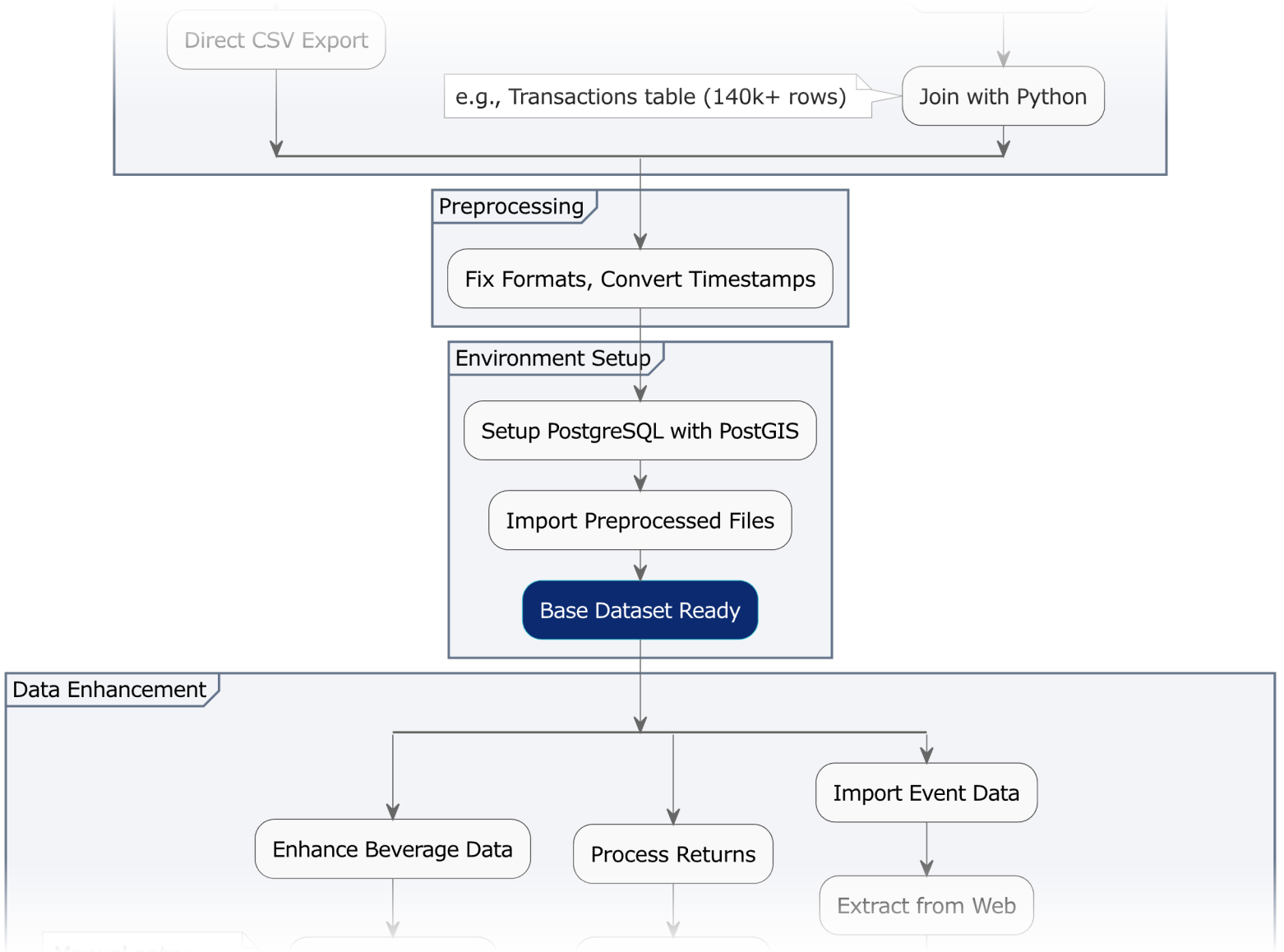

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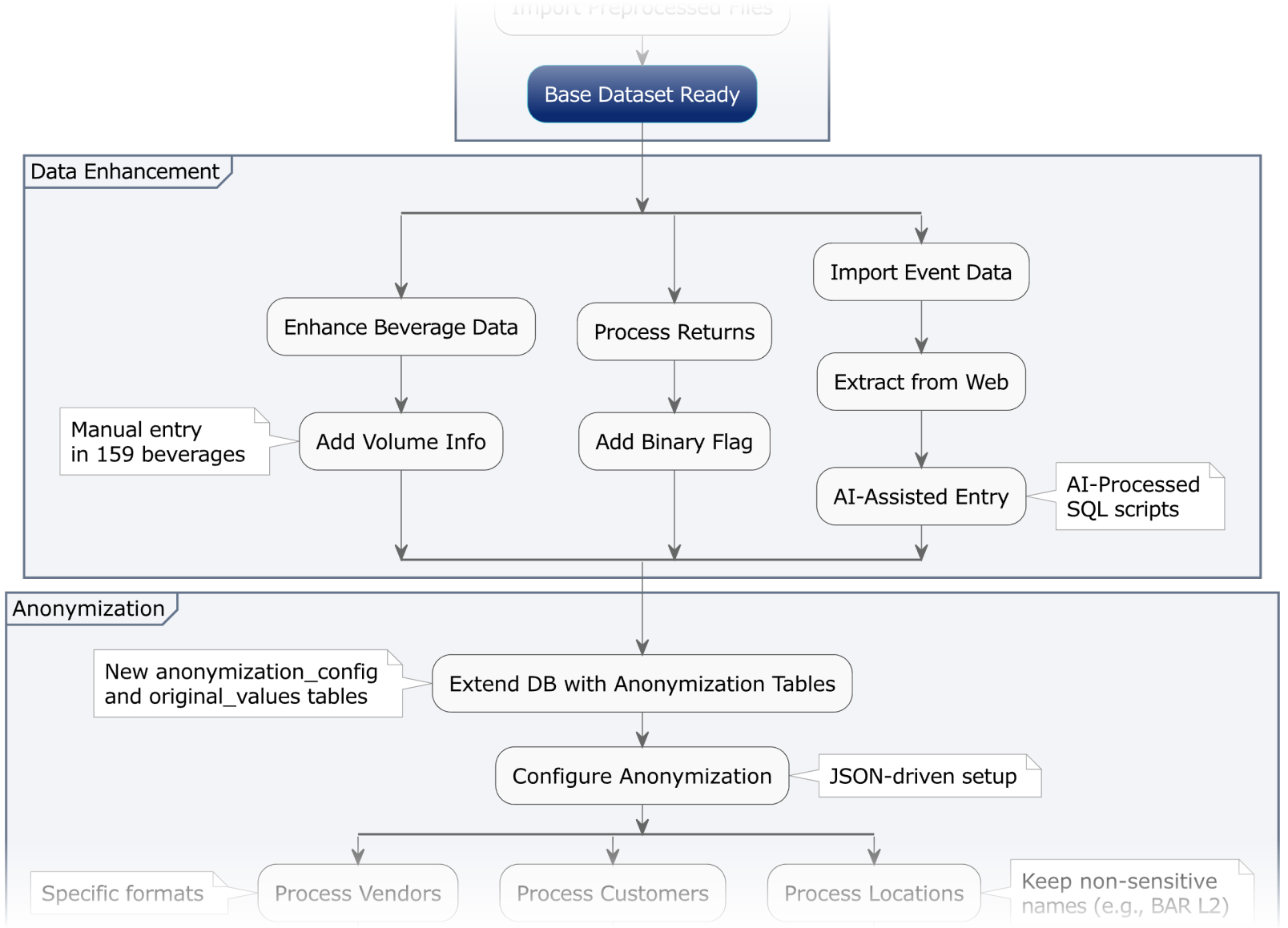

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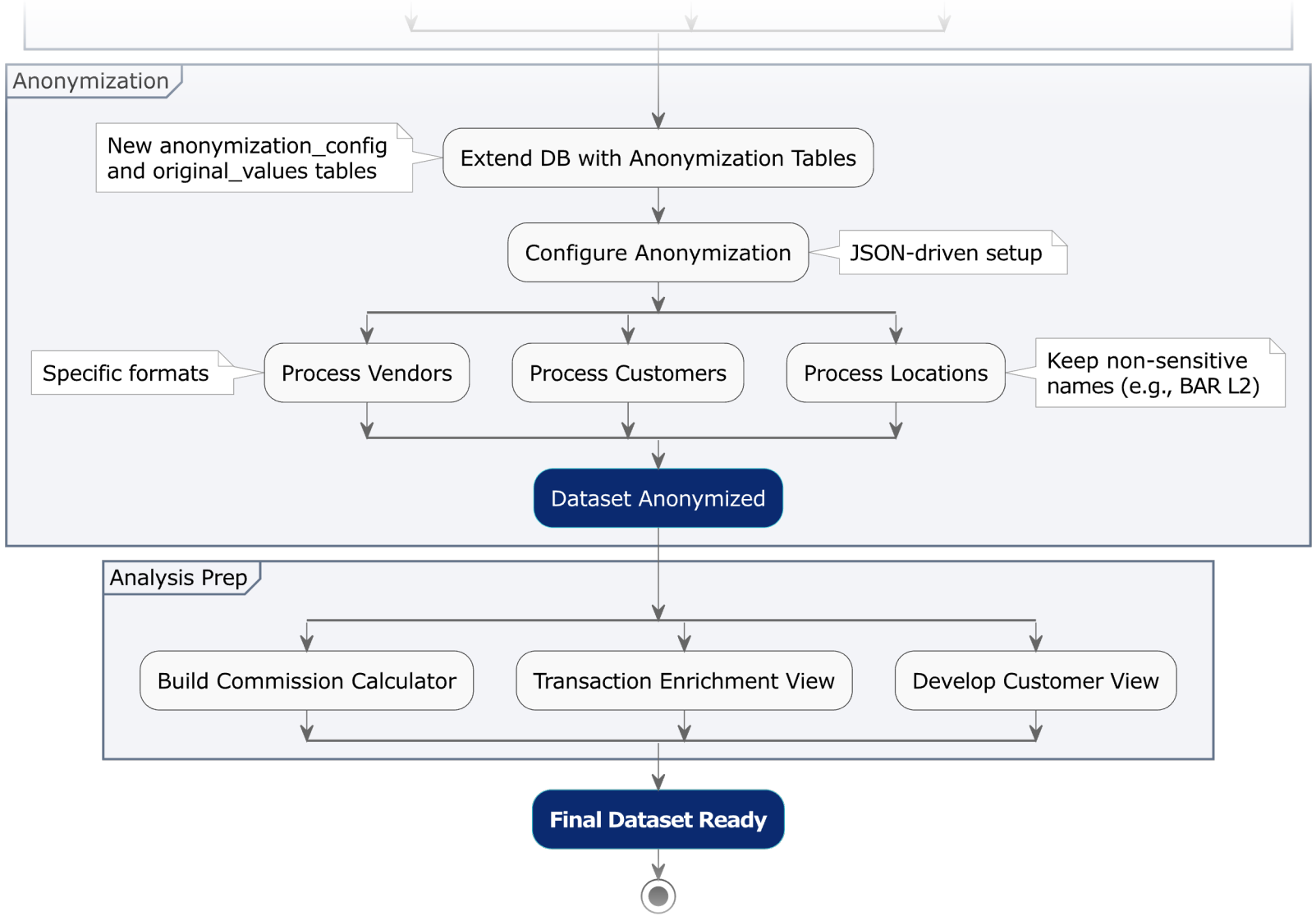

Methodology

Data Collection

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Tools and Technologies

- PostgreSQL Database
- Python
- DataSpell IDE
- Claude AI

Results

Data Analysis Results

29 Research Questions answered

– Cashflow and Revenue Sources

– Performance Indicators

– Beverage Consumption

– Customers

Dashboard Prototype

Using Python, Dash and Plotly

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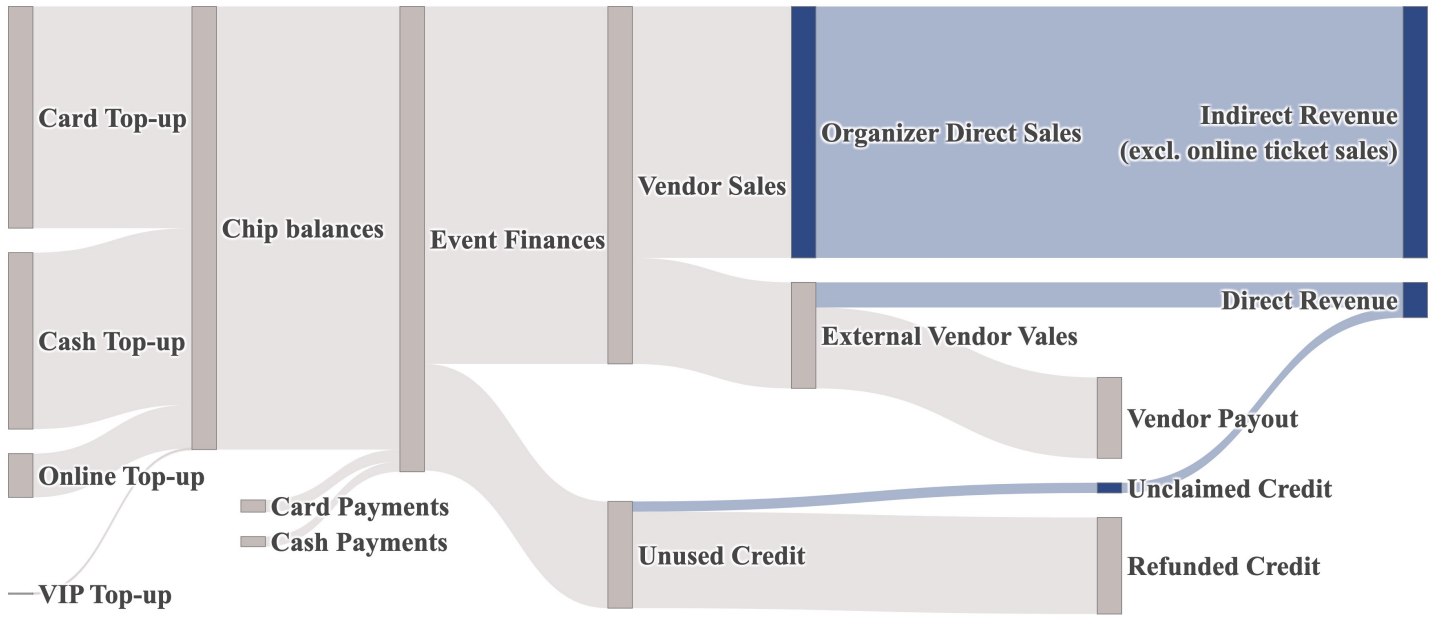
Dashboard Prototype

Using Python, Dash and Plotly

Overall Cash Flow Diagram



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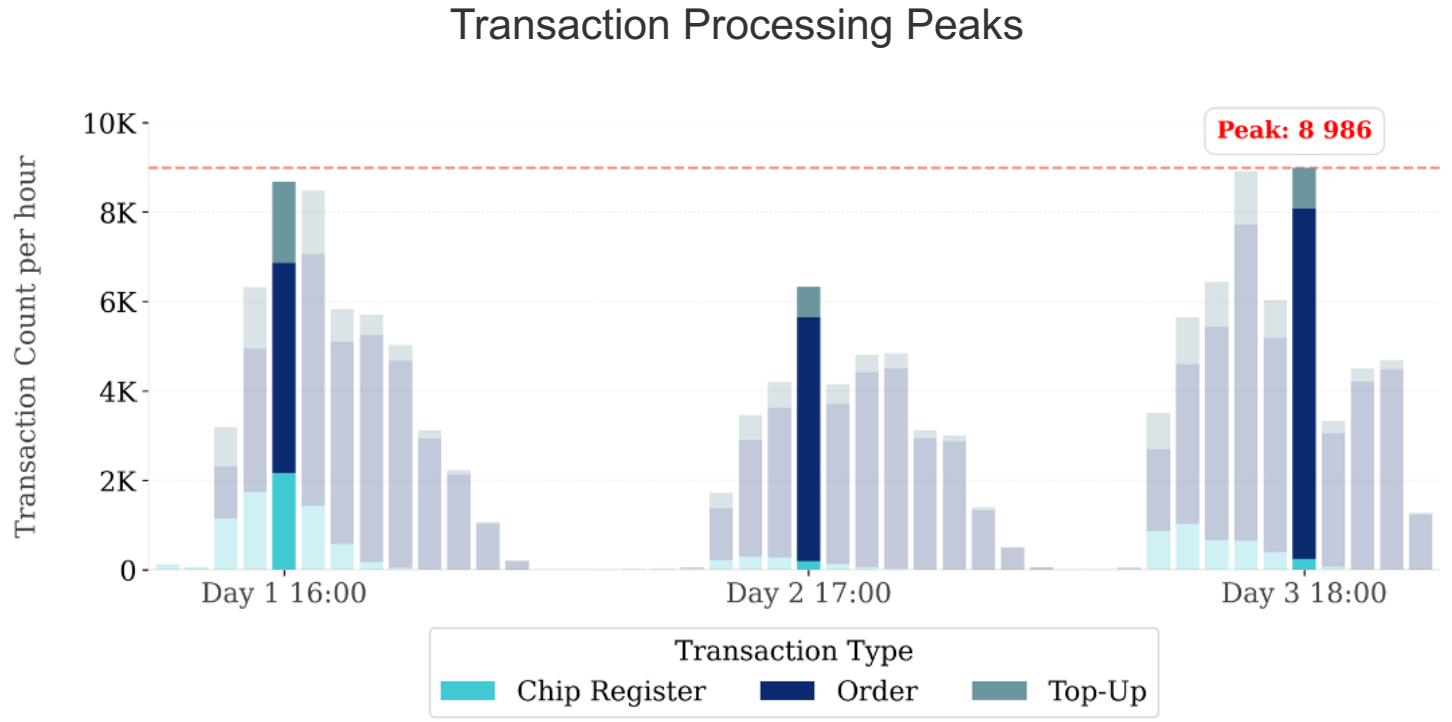

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Using Python, Dash and Plotly

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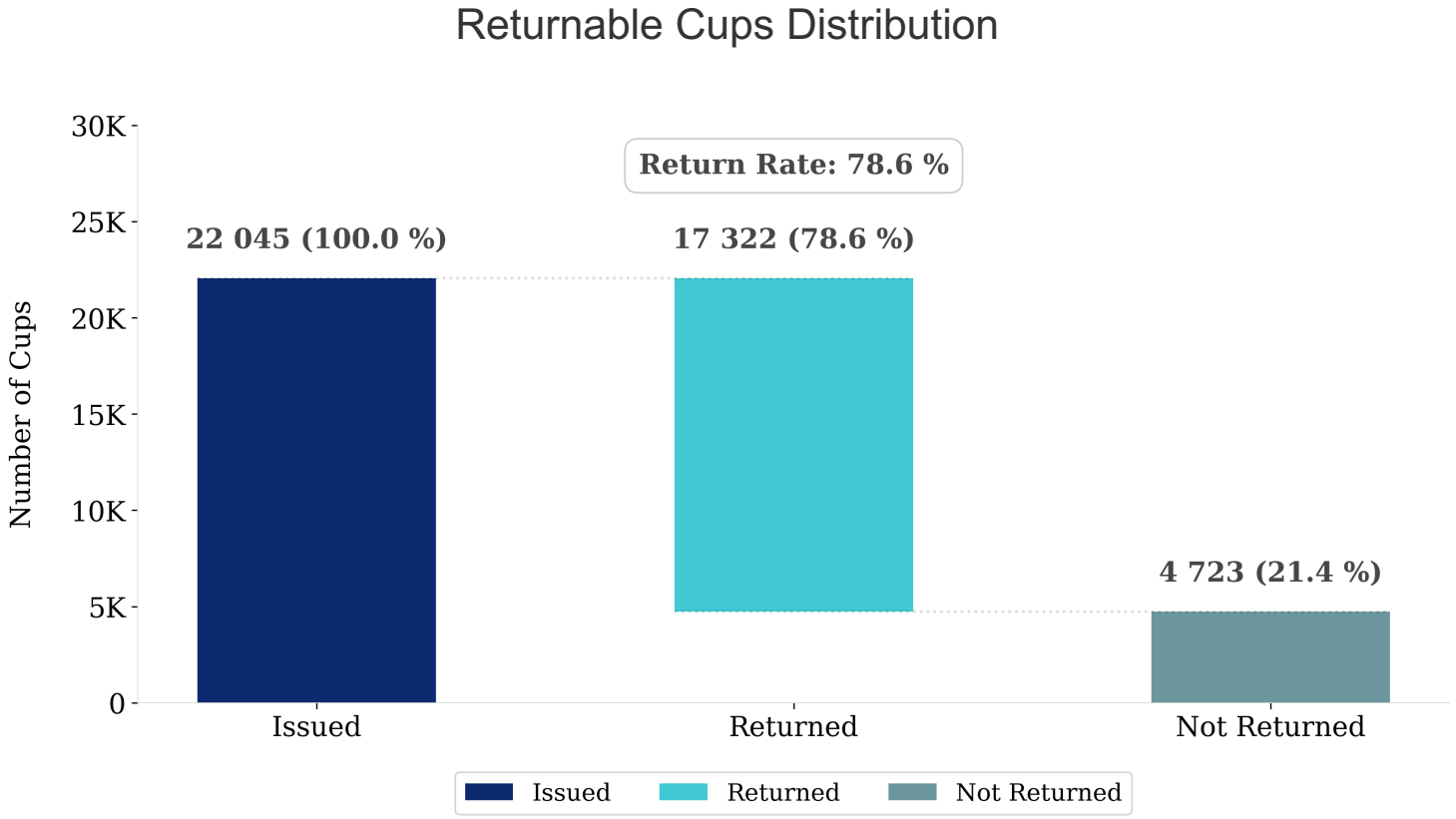

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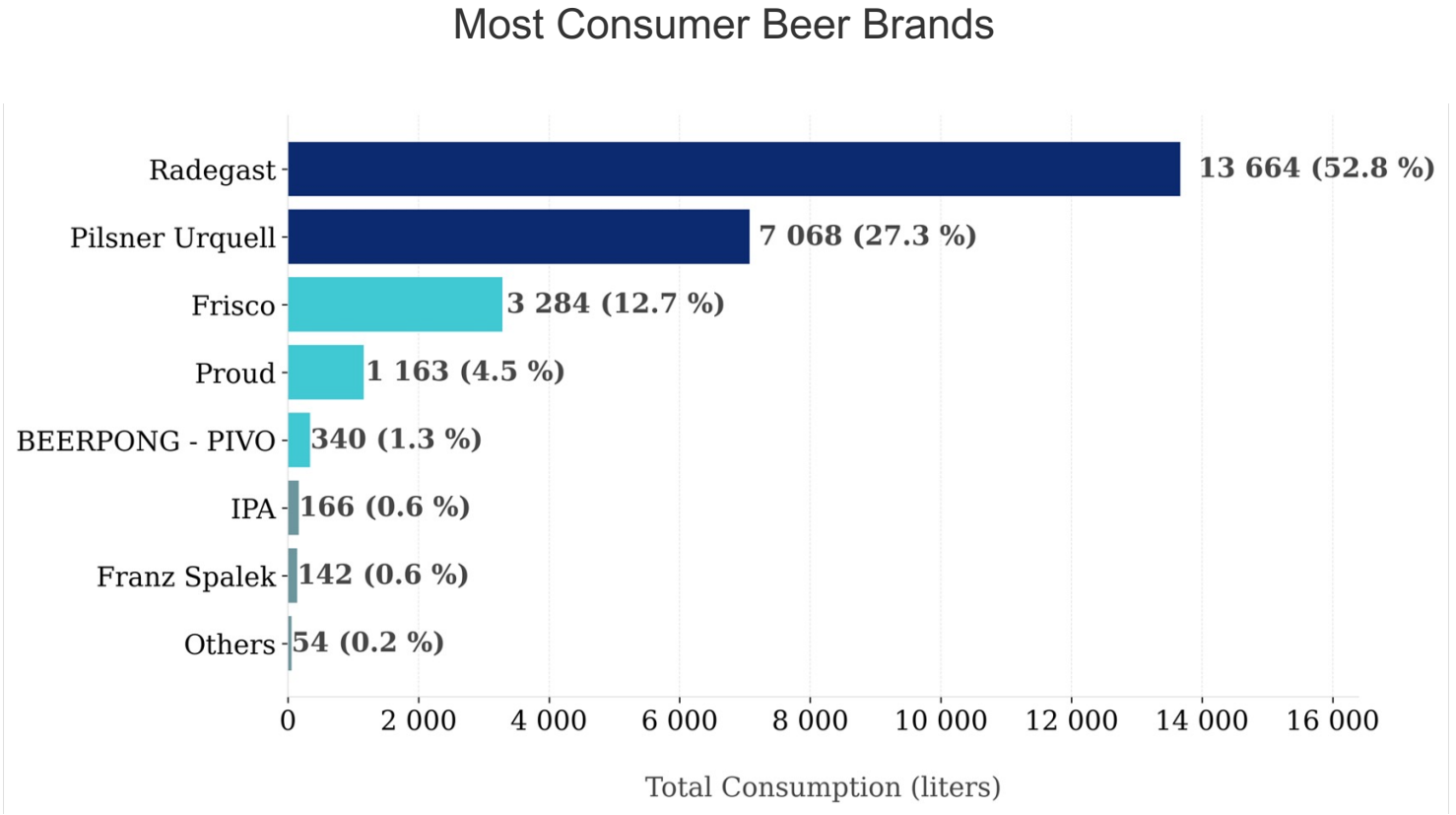

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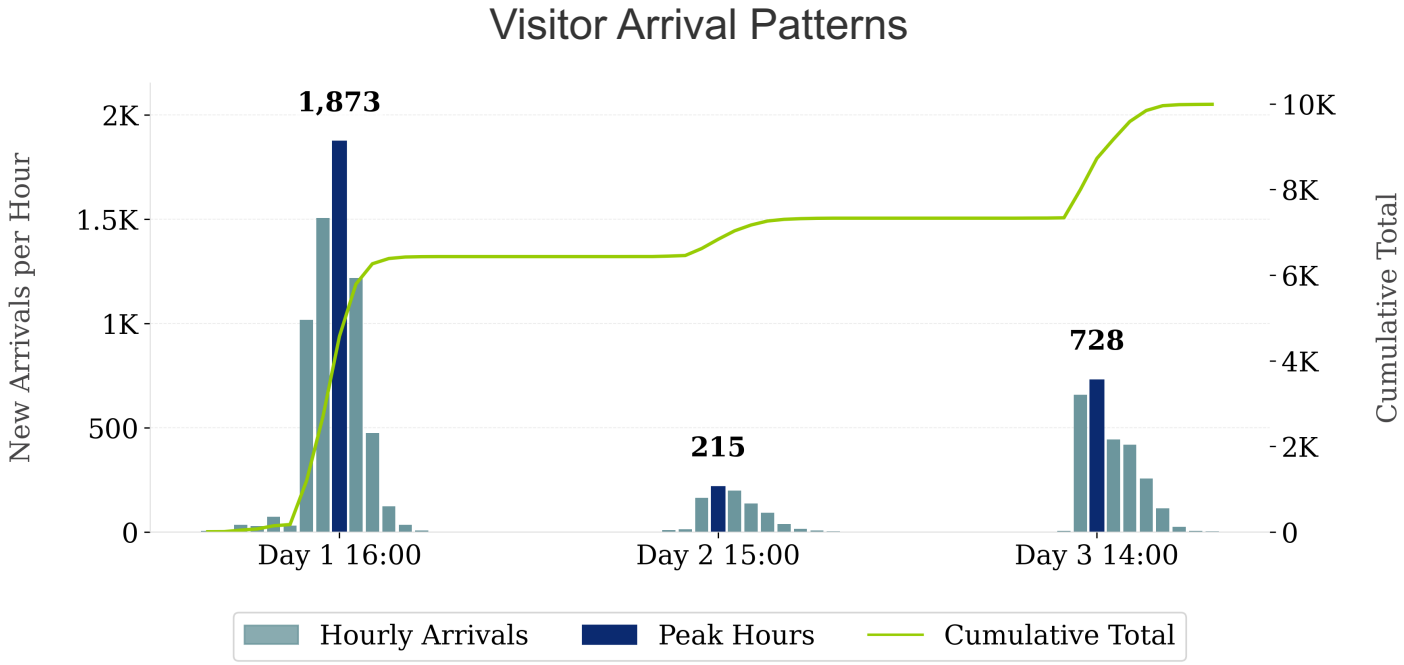

Dashboard Prototype

Using Python, Dash and Plotly

Day 1 (Thursday): **6 214** active customers

Day 2 (Friday): **5 832** active customers

Day 3 (Saturday): **8 066** active customers

Total: **10 009** unique customers

Results

Data Analysis Results

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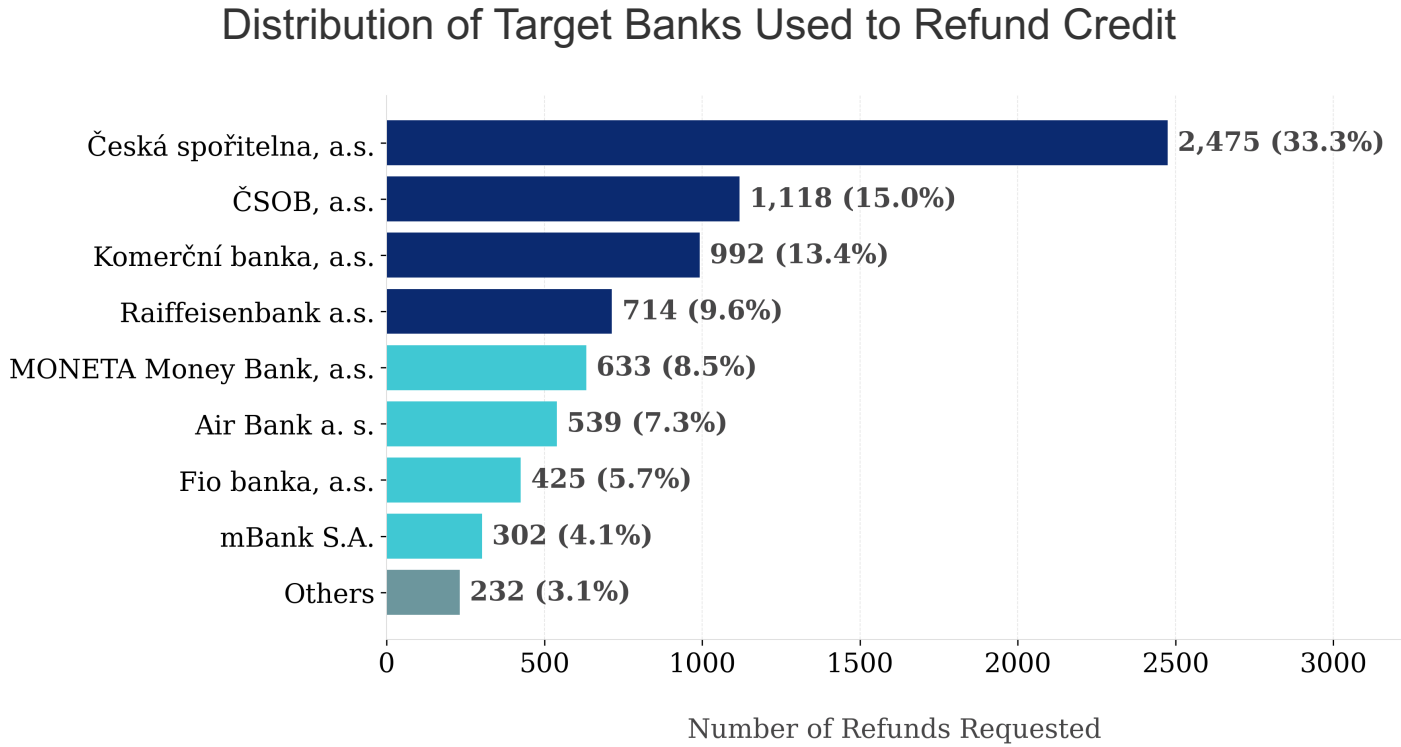

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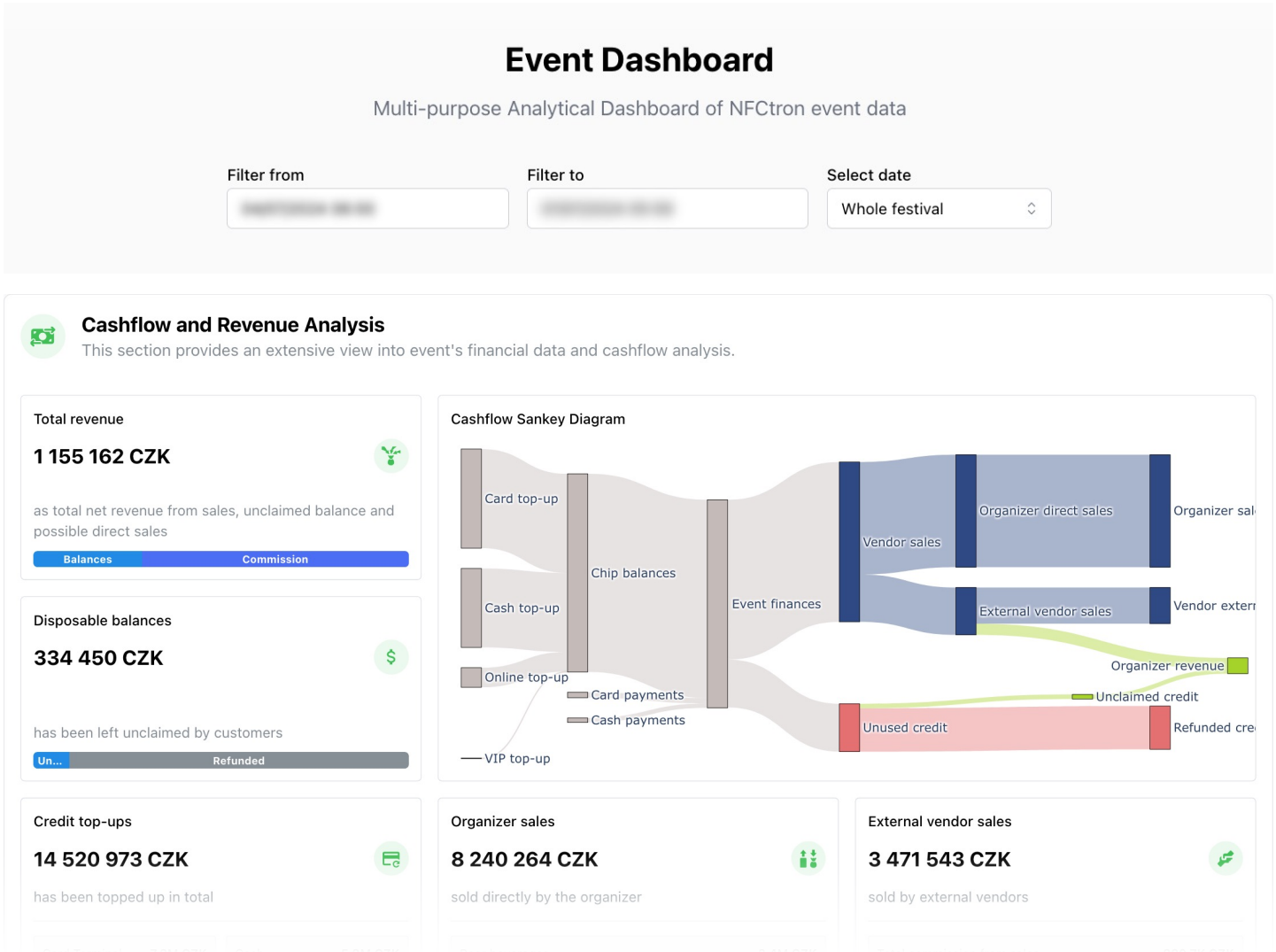

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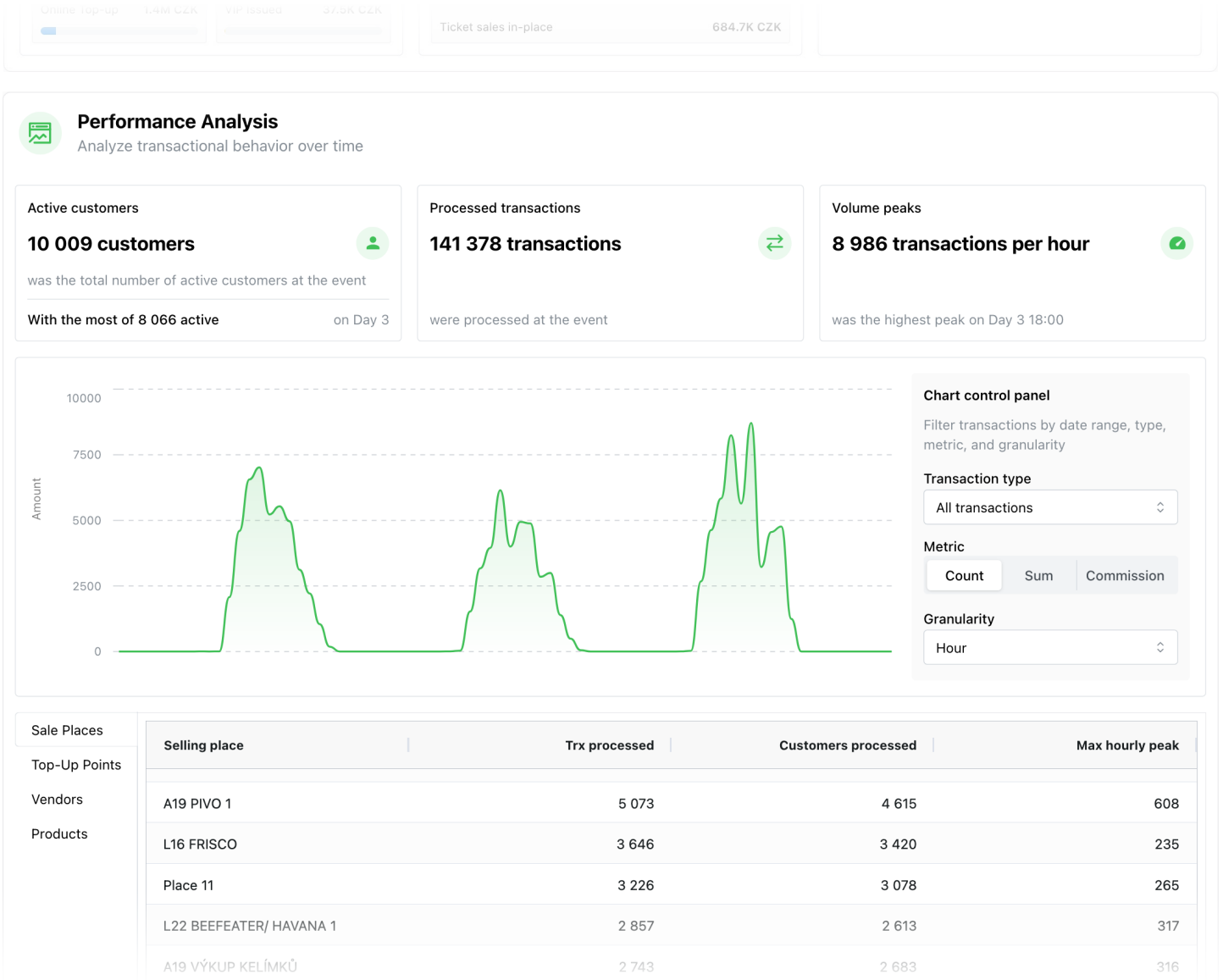

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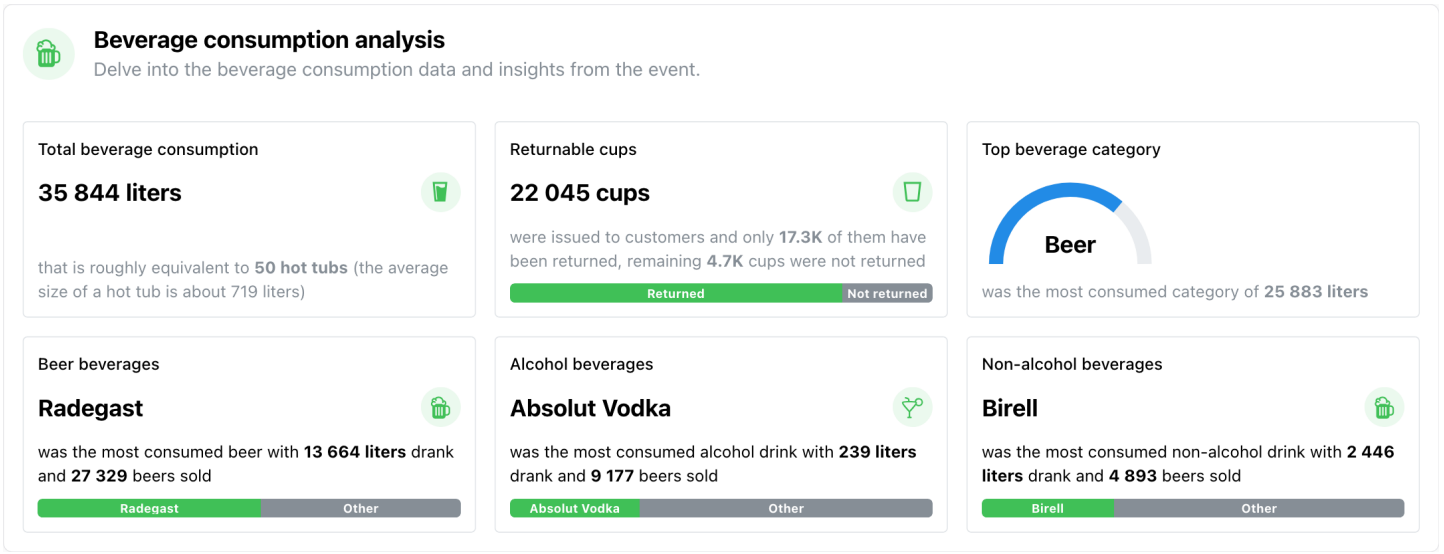
Selling place	Trx processed	Customers processed	Max hourly peak
A19 PIVO 1	5 073	4 615	608
L16 FRISCO	3 646	3 420	235
Place 11	3 226	3 078	265
L22 BEEFEATER/ HAVANA 1	2 857	2 613	317
A19 VÝKUP KELÍMKŮ	2 743	2 683	316
A2 PIVO 1	2 630	2 418	249
L2 HOSPODA PRAZDROJ	2 609	2 154	171
05 PIVO 1	2 572	2 367	217



Conclusion

Summary of Achievements

Professional Impact

Lessons Learned

Conclusion

Summary of Achievements

Professional Impact

Lessons Learned

Comprehensive Data Analysis

- Processed over 141,000 transactions
- Answered all 29 research questions
- Presented most results in a clear graphical way

Technical Implementation

- Developed functional dashboard prototype
- Created efficient data processing pipeline
- Implemented a working anonymization solution

Conclusion

Summary of Achievements

Professional Impact

Lessons Learned

Direct Implementation in NFCtron Hub

- New timeline analysis component (Dec 2024)
- Improved data collection and structure

External Validation

- Major festival organizer independently conducted similar analysis
- Their approach closely aligned with thesis methodology
- Confirms relevance and value of chosen metrics

Conclusion

Summary of Achievements

Professional Impact

Lessons Learned

Technical Insights

- Importance of data pre-processing
- Value of efficient caching mechanisms
- Importance of clear objectives definition

Business Insights

- Critical metrics and valuable data for organizers
- Financial patterns and cash flows at a festival
- New opportunities for system improvements

Questions from Reviews

Thesis Supervisor

Mgr. Václav Alt, Ph.D.

1. Could you elaborate on to what extent was the customer (The Organizer) involved in the development? Did they present a set of requirements you ought to fulfill, or was it more of a leap of faith?

2. One of your main concerns before you started working on the project was the anonymization of the data. From the thesis I understand it went quite smoothly. Could you comment on your experience with anonymization? Do you have any suggestions on how to do it differently?

3. Would you wish to alter the data collection somehow? (gather some data that was not gather, choose a different format etc)

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Ing. Hana Flusková

1. Do the KPIs and metrics in the NFCtron app vary by customer or do all customers have the same options in the app?

2. Why is the student only looking at the best performance and metrics, not the worst, where potentially the client is incurring financial losses and should be focused on addressing them?

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