Munich University of Applied Sciences
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sustAInability Project Report

City of Munich Team 1 - EasyRide Family - a Smart Consulting Tool for a Sustainable Family Cycling

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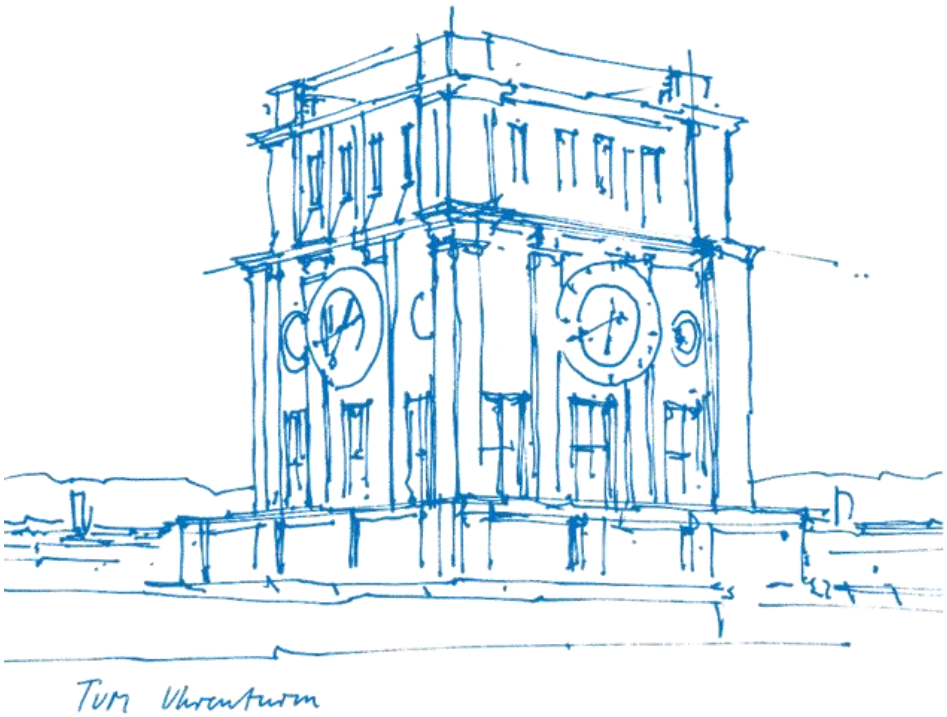

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1 Mission Statement (Ying Jin)

Our mission is to make family cycling in Munich more accessible and practical by integrating a dedicated rental section for family-friendly bicycles directly within the MVGo app. This initiative helps families discover, select, and rent the ideal bicycle setup according to their destination and travel needs, quickly and easily.
By aligning with the City of Munich's sustainable mobility goals and supporting the objectives of the Go!Family[1] initiative, EasyRide champions a more inclusive and eco-friendly transport system for local families and visitors alike. We aim to remove logistical barriers, reduce planning stress, and empower parents to explore the city confidently with their children. Through this, we encourage healthier habits, stronger community connections, and an enhanced family experience tailored to real-life needs.

2 Challenge Overview: Changing Mobility Behaviour through Personalized Consulting (Ying Jin)

In a city like Munich, characterized by increasing traffic, limited space, and pressure from climate change, redefining mobility habits is crucial. The Mobilitätsreferat´s ongoing project, "Go! Family," already supports families with eco-friendly transportation trials, such as cargo bike rentals and public transport tickets. However, the process is currently analogue and lacks real-time personalized support.
Families often face overwhelming decisions when planning mobility with children: What type of bike is safe for a newborn or a 3-year-old? Which routes feel safe? Will I arrive dry and on time? These questions remain unanswered without guidance. The challenge lies in delivering a tailored, digital experience that respects families' unique needs and encourages them to shift toward greener mobility habits joyfully and not judgmentally.

2.1 Statistical Insights from Munich (Ruize Yuan)

Family Demographics in Munich

As shown in Figure 1[2], families with children account for 17.8% of all households in Munich. Additionally, the number of annual tourists visiting Munich is approximately five times that of the local population, with nearly half being foreign visitors who particularly require advanced route planning and bicycle recommendation features. These figures indicate a vast potential user base for this software, making its development in Munich highly strategic.

Population (December 31th, 2023 resp. in 2023)		
Inhabitants (registered with main residence in Munich)		**1 589 026**
Private households		**854 396**
Single person households	54.0 %	461 441
Couples without (underage) children	23.7 %	202 871
Couples with (underage) children	14.4 %	122 716
Single parents with (underage) children	3.4 %	28 714
other multi-person households	4.5 %	38 654

Tourism (December 31th, 2023 resp. in 2023)	
Hotels, guest houses and pensions	**463**
Number of beds available	97 150
Total number of guests	**8 531 177**
From Germany	5 060 869
From abroad	3 470 308
From the United States	529 710
Austria	288 491
Italy	267 785
Great Britain and Northern Ireland	252 583
Switzerland	247 722

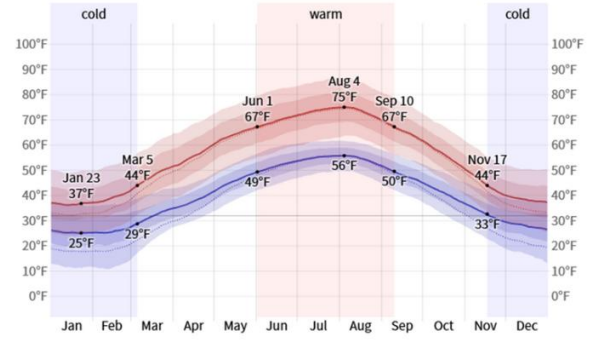
Figure 1 Munich population statistics in 2024[2]

Infrastructure Potential

Considering the geographical conditions, the citiy of Munich is generally flat. Nowadays, Munich's cycling network extends over 1200 kilometers. According to a local survey, almost equal numbers of men and women use bicycles for commuting, shopping, and other private activities. Approximately 80% of Munich's residents own a bicycle, and almost half of all residents use it at least once a week. Regarding gender differences, the survey indicates that men and boys ride their bicycles more often to reach educational institutions and for leisure, whereas women cycle more frequently for shopping. Consequently, Munich is investing in protected bike lanes, which provide safer and more comfortable cycling experiences[3].

Climate and Space Constraints

According to Figure 2, Munich enjoys cycling-friendly temperatures from March to early November. Its summers and winters are neither too hot nor too cold, creating favorable conditions that encourage cycling.



Average	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
High	37°F	39°F	48°F	56°F	64°F	70°F	74°F	73°F	66°F	56°F	45°F	38°F
Temp.	31°F	32°F	40°F	47°F	56°F	61°F	65°F	64°F	57°F	48°F	39°F	33°F
Low	25°F	26°F	32°F	38°F	46°F	52°F	55°F	54°F	48°F	41°F	33°F	28°F

Figure 2 Munich annual temperature change[4]

2.2 Why Munich is the Ideal City for EasyRide Family (Aurora)

Munich offers the perfect setting for EasyRide Family to succeed. The city's geographical conditions (generally flat terrain) make it naturally bike-friendly, lowering physical barriers for families with young children.

The city also boasts an extensive cycling network with more than 1,200 km of bike lanes and continues to invest heavily in expanding and improving its infrastructure. Recent projects include the development of protected bike lanes, offering safer and more comfortable experiences for cyclists, a key factor for families concerned about safety.

In terms of accessibility, Munich has significantly increased its bicycle parking capacity, building 3,600 new spaces in 2020 alone, making it easier for families to integrate cycling into their daily routines.

Moreover, trends show growing interest in family-oriented cycling solutions: in 2023, 206,000 bicycle trailers were sold in Germany, and cargo bike sales even surpassed trailer sales by 14%, reflecting a clear demand for practical, family-friendly transport alternatives. Combined with its strong public transport network and sustainability initiatives like Go!Family, Munich is not only ready but ideal for a service like EasyRide Family; a solution that makes sustainable, safe, and accessible mobility a reality for young families.

3 EasyRide Family Solution: Munich's Family Mobility Assistant (Ying Jin and Aurora)

3.1 Problem and Solution

Families with young children in Munich often struggle to find safe and practical mobility options. While bike-sharing and mobility apps exist, none fully address the needs of families. Easy Ride is a personalized interface within the MVGO app that serves as a digital mobility assistant. It helps families choose suitable bikes and plan safe, family-friendly routes by combining family profiles, urban mobility data, and real-time conditions. The goal is to empower parents to make confident, independent, and sustainable mobility choices within the public transport system.

3.2 Key Features

Smart, Safe & Meaningful Routes

Easy Ride provides tailored cycling routes based on the family setup—cargo bike, trailer, or child seat. An AI-powered route planner considers bike lanes, traffic, weather, and terrain to suggest safe, convenient options. It also recommends meaningful stops, like:

- Playgrounds and parks for breaks
- Bike-friendly cafés and picnic spots
- Cultural/nature destinations for weekends
- Shaded or low-traffic paths for comfort

The **Safety Companion** offers dynamic tips, checklists, and video tutorials based on the current route and traffic. If a high-traffic zone is detected, the app suggests safer alternatives or guides the user in real time, helping families feel secure and relaxed during their trips.

Smart Bike Advisor

This feature recommends the best bicycle setup based on family needs: number and age of children, budget, cycling experience, usual routes, weather, home storage space, or stroller transport. It simplifies choices by showing a curated list with pictures and practical notes (e.g., “ideal for rainy days”).

Designed as a friendly conversation, the Advisor uses clear language and illustrations to help even first-time biking parents find the right fit—and rent or reserve a bike directly via MVGO.

3.3 Market Overview & Existing Solutions

Several apps in Munich offer bike rentals or maps (MVG Rad, Donkey Republic, nextbike), but none truly cater to families, especially newcomers or tourists with children.

What makes Easy Ride different?

- **All-in-one platform:** Combines bike rental, safe routing, equipment advice, educational content, and community input.
- **Family-first approach:** Designed specifically around families' needs—not just adapted to them.
- **Hyper-personalization:** Considers children’s age, weight, biking experience, weather sensitivity, and daily routines.
- **Simplicity and safety:** Clear, guided routes and real-time safety checks reduce stress and build trust.
- **Education and confidence-building:** Tutorials and reviews help users learn how to safely ride with children in a new city.

4 User-Centered Design Process: Prototyping and Insights (Aurora)

4.1 Initial Research & User Engagement

We began by studying the Go!Family initiative and connecting directly with young families and soon-to-be parents in Munich. Surveys and three informal interviews uncovered high interest in cycling—alongside concerns about safety, logistics, and bike choice.

4.2 Persona Development

To keep our focus user-driven, we developed the persona “Max”—a father of two eager to switch to cycling but struggling with safe routes, proper bike setups, daily logistics, and staying within budget. This persona helped clarify core needs: clear guidance, safety, simplicity, affordability, and emotional reassurance.

4.3 Defining Key Use Cases

Our research identified the main scenarios for EasyRide Family:

- Parents commuting with toddlers to daycare or school
- New residents unfamiliar with Munich’s bike infrastructure
- Cost-sensitive families seeking alternatives to car ownership
- Leisure trips with strollers or trailers

4.4 User Flow and Prototype Design

Based on these scenarios, we designed a seamless user flow: families input their mobility needs into the MVGO app and receive tailored bike and safe route recommendations.

4.5 Mobile-First Interface & Design Priorities

Our prototype is optimized for smartphones, focusing on:

- Simplicity: Intuitive visuals, icons, and minimal form fields
- Child-Safety: Bike options filtered by child's age and weight
- User-Centeredness: Recommendations with zero commercial/brand bias

5 AI-Based Family-Friendly Route Optimization & Configuration Recommendation (Jingyuan Ma)

5.1 AI-Powered Route Planning

Our system uses an AI-driven, machine learning cost function instead of simple distance minimization. This approach prioritizes safety, comfort, and infrastructure for families[5].

Feature Extraction

For every road segment, we extract attributes (feature vector) X_e such as:

- Length and slope
- Safety factors (e.g., speed limit, lane count)
- Comfort (e.g., surface type, bike lane presence)
- Environmental context (e.g., proximity to parks)

Training Data

We assign each segment a "family-friendliness" score using a weighted formula[6], [7]:

$$Y_e = \omega_1 \cdot Length_e + \omega_2 \cdot Slope_e + \omega_3 \cdot (1 - Safety)_e + \omega_4 \cdot (1 - Comfort)_e + \ldots$$

Machine Learning Model

A Random Forest regressor maps these features to cost scores, capturing complex relationships[8].

$$\hat{Y}_e = M(X_e)$$

Route Optimization

The trained model predicts a cost for each link. Using these as edge weights, Dijkstra's algorithm finds the optimal family-friendly route, often preferring safer, quieter roads over the shortest path.

$$FamilyCost_e = M(X_e)$$

5.2 Case Study: Family Cycling from City to Nature

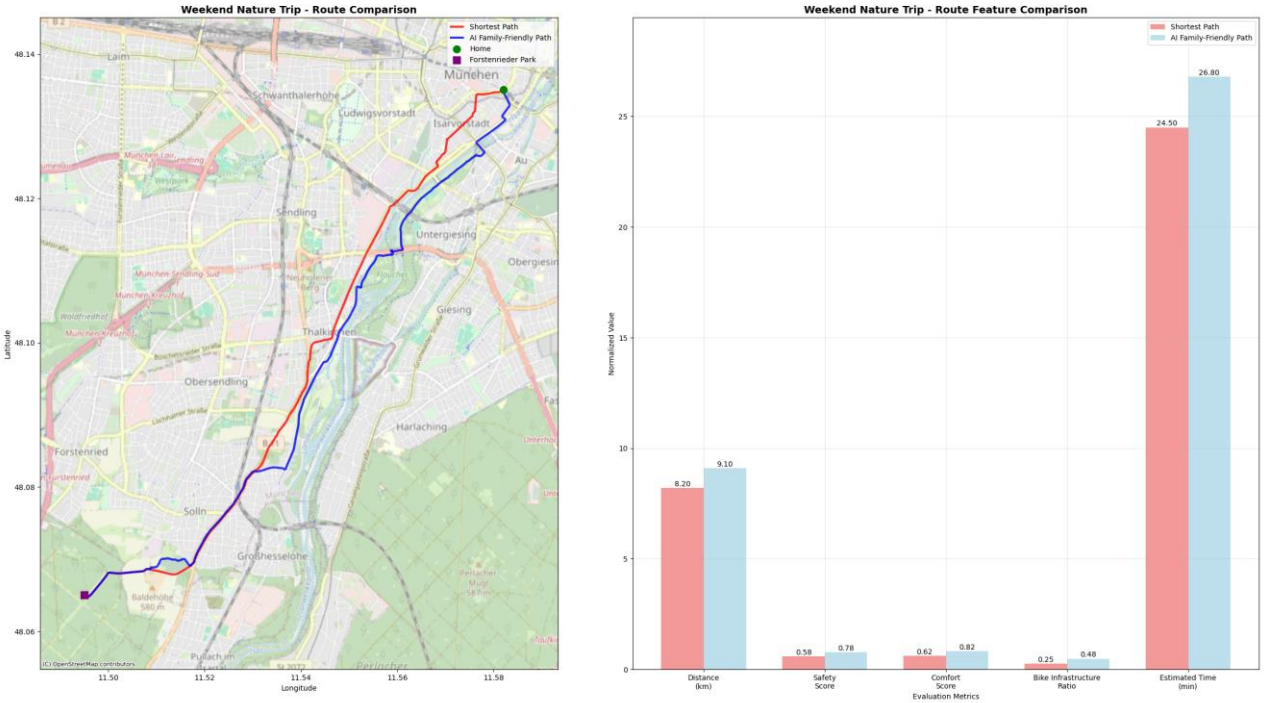


Figure 3 Family Weekand Route Planning Example and Comparison

As shown in Figure 3, the AI route (blue) avoids main roads, utilizing quieter, greener streets compared to the shortest (red) route. The family-friendly trip is only 10% longer (9.1 km vs. 8.2 km) and takes about 10% more time (26.8 min vs. 24.5 min), for significant gains in comfort and safety.

5.3 From Route to Bike & Accessory Configuration (CSP)

We formulate bike and accessory selection as a Constraint Satisfaction Problem (CSP) based on route outputs.

Workflow:

1. Analyze Route Outputs: Determine needs such as electric assist, stability, lighting, and child transport.
2. CSP Formulation: Define variables (bike type, children, budget, e-assist, terrain fit, accessories) and constraints (safety, budget, suitability).
3. Recommendations: The CSP solver outputs optimal configurations.

Example Recommendations:

Table 1 Family Weekand Example Route CSP Bike Recommendation

Option	Primary Bike	Child Solution	Safety Accessories	Total Cost	Suitability
1	E-Cargo Bike (Urban Arrow)	2x integrated child seats	LED lights, vests, helmets	€3,200	9.2/10
2	E-Bike + Trailer	Thule Chariot Sport 2	Safety flag, rear lights, helmets	€2,400	8.8/10
3	Standard Bike + Attachments	Front + rear child seats	Basic lighting, reflectors	€1,100	7.5/10

6. Desired Impact: Empowering Family Mobility (Laura Santiago)

With EasyRide Family, our goal goes beyond developing a mobility app. We strive to foster trust, reassurance, and optimism for families navigating a new city. We want families to feel:

- **Understood:** Their unique needs and concerns are recognized and addressed.
- **Supported:** They can rely on the app for personalized, practical guidance.
- **Confident:** Family cycling becomes approachable, safe, and stress-free.
- **Empowered:** Families can explore the city with greater freedom and peace of mind.

EasyRide Family aims to make urban cycling a viable and uplifting choice for families, turning everyday journeys into positive experiences.

Why EasyRide is the Most Complete and Future-Proof Solution

EasyRide Family uniquely addresses the unmet mobility needs of families in Munich through a fully integrated AI-enhanced and family-first approach. While existing solutions such as MVG Rad, Monkey Republic or Next Bike offer bike rentals and basic navigation, they are not tailored to the daily challenges of families with children[1].

Unlike these generic platforms, EasyRide Family is designed from the ground up to support families in every aspect of cycling, mobility, planning, safety, education and confidence, it's Smart Bike Advisor recommends bike setups based on children's age, wheather, terrain and experience levels[1]. The AI-powered route planner prioritizes safety and comfort over mere distance, offering child friendly and stress-free paths[5].

Another key advantage of EasyRide Family is its all-in-one integration. It combines route planning, safety tips, community insights, and bike booking, all within the existing MVGO app. No competitor offers this level of personalization and functionality in one place.

The need is evident, families make up 17.8% of Munich households and demand for cargo bikes and trailers keep growing[2], [3], yet no digital solution provides tailored support for family cycling. Even the Go!Family initiative, while promising, remains analogue and lacks the scalability and real-time feedback EasyRide delivers[4].

By embedding this service in Munich’s transport system, EasyRide not only fills a clear gap but also advances the city’s sustainable mobility goals. It empowers families to shift from car use to confident, safe and ecofriendly cycling.

Ultimately, EasyRide Family is more than an app. It's a strategic, family centered solution aligned with public policy and urban needs.

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