SOCIAL SIMULATION

Kilian Theil

Chair of Artificial Intelligence

Data and Web Science Group

23 March 2021

UNIVERSITY OF MANNHEIM
School of Business Informatics and Mathematics

INTRODUCTION

Kilian Theil

PhD student @Chair of AI

Prof. Heiner Stuckenschmidt

Head of the Chair of AI

CONTEXT: PROJECT CAIUS

- "Consequences of Artificial Intelligence on Urban Societies"
- Research project together with Prof. **Frauke Kreuter** (Uni Mannheim) & Prof. **Kai Eckert** (HdM Stuttgart)
  - funded by Volkswagen Foundation with **1.5M** for the next **4 years**
- Explores impact of smart cities on social (in)equality
  - Use case: **dynamic pricing of parking space** and its effect on **socioeconomic disparity**

IN THIS PROJECT, YOU'LL …

- … build a **simulation model** mirroring the **car traffic of Mannheim** city in NetLogo
- … implement a **dynamic pricing** mechanism for parking space & simulate its effects on the **socio-economic mixup**

NETLOGO PROTOTYPE

- Participants of our Master's **seminar 2020** already developed a **prototype** in **NetLogo**:
  - Madeleine Aziz, Jens Daube, Paul Exner, Jakob Gutmann, Jonas Klenk, and Aamod Vyas
- You'll build upon this protoype and enhance it will **geo-spatial data** of the city

Tools Zoom Tabs Help

Info Code

Delete Add Button normal speed ticks: 875 view updates on ticks Settings...

Setup Go

Traffic Grid

-cars 300

On Off demo-mode

s-per-cycle 20 On Off hide-nodes

On Off show-goals

distribution-percentage 40 %

Parking Fees

Initial Fees Current Fees

w-lot-fee 2.5 € / hour yellow-lot-fee 2

ge-lot-fee 2.5 € / hour orange-lot-fee 2

n-lot-fee 2.5 € / hour green-lot-fee 1.5

lot-fee 2.5 € / hour blue-lot-fee 2

low high should the fines be in terms of the riginal hourly fee?

fines-multiplier 5 time(s)

low often every hour should one of the ots be controlled?

controls-per-hour 1 time(s)

Income Distribution

mean-income 25882 €

median-income 22713 €

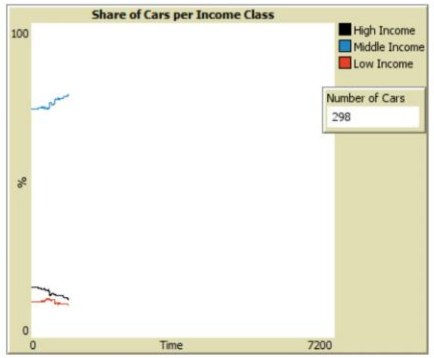
ncome-share 0.005

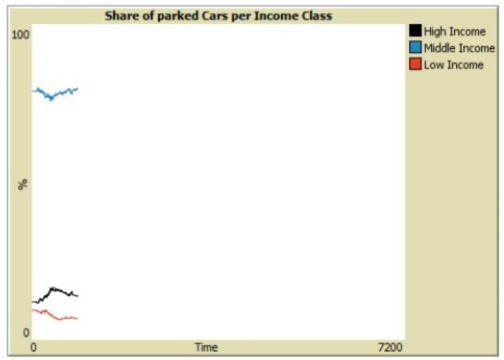
Min Income in Model 6275.61

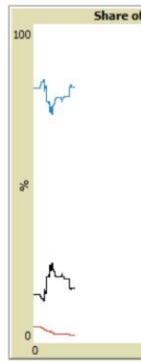
Mean Income in Model 24794.13

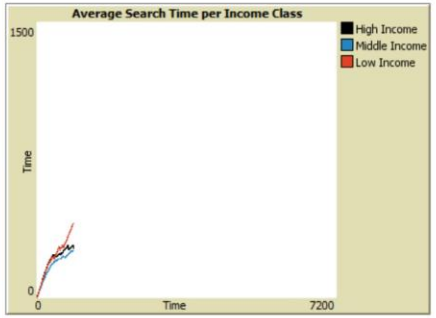
Max Income in Model 62450.9

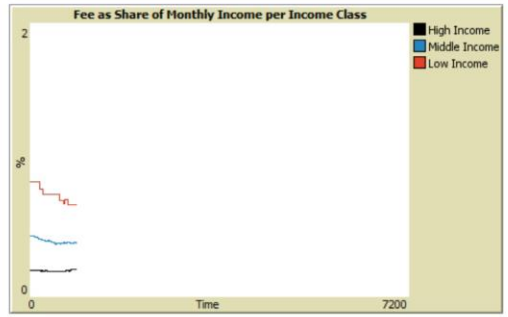
Social Indicators

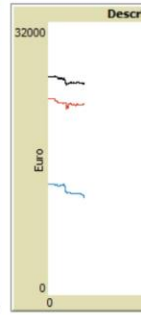




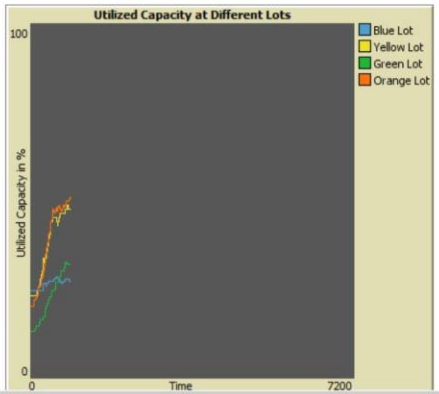


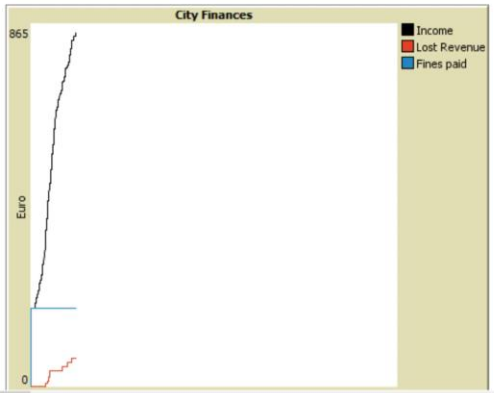






Traffic and Financial Indicators

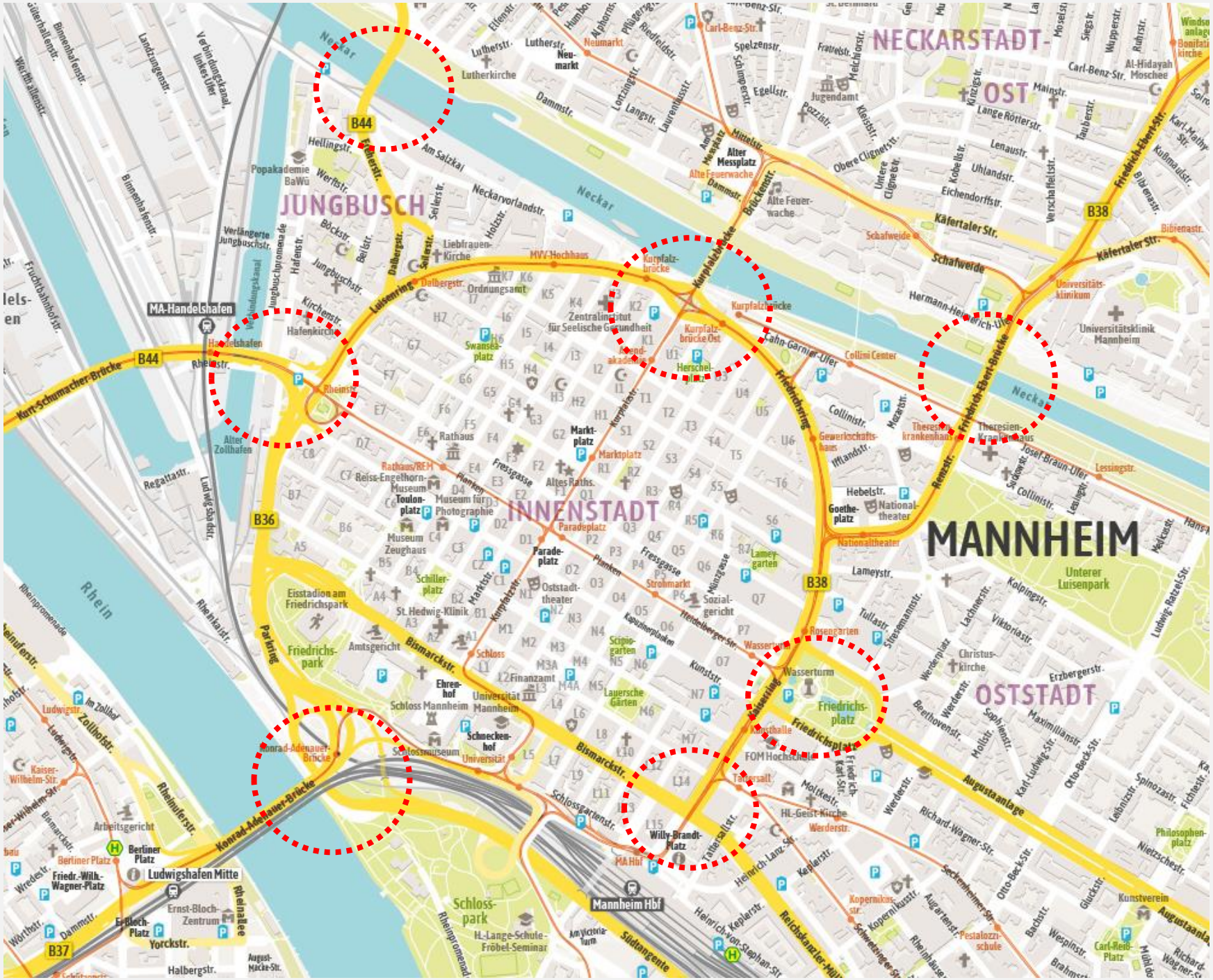




d Center

TASK

- Complete the NetLogo prototype by adding **main traffic arteries**, …
  - Ring (around) Fressgasse, Bismarck- & Kunststraße (within)
- …, **feeder roads and exits**, …
  - Augusta-Anlage, Rhein & Neckar bridges, Bundesstraßen
- …, and **parking facilities**
  - Parking lots & garages



+ parking spaces & garages

+ ring road around the city

+ Fressgasse, Kunst- & Bismarckstraße within the city

(optional) What happens if one of the roads is closed?

TOOLS

- Development will be done in NetLogo
  - Link to documentation
  - For more context information about ABM & NetLogo, please check out the slides of last year's seminar
- NetLogo GIS extension

SOURCES & CONTACTS

- Mannheim's Geo Information System (GIS)
  - City plans
  - Statistics of car users
- Two alumni of last year's "Social Simulation" seminar are writing their thesis with us:
  - Jakob Gutmann (M.Sc. thesis on dynamic pricing for parking space)
  - Paul Exner (B.Sc. thesis on automatic parking controls)

MODALITIES

- You can **opt out** of the team project without failing the course **by April 5**
- **Bi-weekly meetings** to discuss progress
  - day & time will be determined via Doodle
- **Grading**
  - After 2 months: 1st presentation & *individual* report (**25%**)
  - After 4 months: 2nd presentation & *individual* report (**25%**)
  - After 6 months: final presentation & *group* report (**50%**)