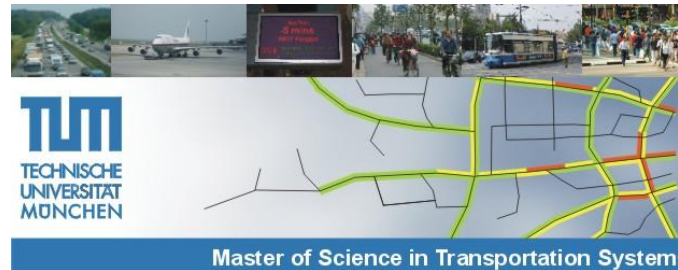


M.Sc. in 'Transportation Systems'



Applied Statistics in Transport Introduction

Prof. Regine Gerike

Technische Universität München, mobil.TUM

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Munich, 18/10/2011

Plan for Today's Lecture

- We – mobil.TUM
- You – Experiences and Expectations
- Organisational Remarks
- Statistics – Short Introduction and Topics for the Semester

Structure of the Institute for Transportation at TU München

Institute for Transportation

**Chair of traffic
engineering and
control**

Prof. Dr.-Ing. Fritz Busch

**Department of urban
structure and
transport planning**

Prof. Dr.-Ing.
Gebhard Wulfhorst

**Chair and institute of
road, railway and
airfield construction**

Prof. Dr.-Ing. Stephan
Freudenstein

Interdisciplinary Project Group "Mobility and Transport"

Prof. Dr.-Ing. Regine Gerike, Dr. Sven Kesselring, Dr.-Ing. Andreas Rau

Contact for Questions

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- Tel +49.89.289.28575
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Learning Outcomes:

- expressed in terms of competencies or skills and competence, levels:
- C1 Knowledge
- C2 Comprehension
- C3 Application
- C4 Analysis
- C5 Synthesis
- C6 Evaluation

Learning outcomes on Master level:

- Students:
 - can demonstrate knowledge and understanding
 - can apply their knowledge and understanding, and problem solving abilities in new or unfamiliar environments
 - have the ability to integrate knowledge and handle complexity, and formulate judgements with incomplete or limited information
 - can communicate their conclusions, and the knowledge and rationale underpinning these, to specialist and non-specialist audiences
 - have the learning skills to allow them to continue to study in a manner that may be largely self-directed or autonomous
-
- C1 Knowledge, C2 Comprehension, C3 Application
 - C4 Analysis, C5 Synthesis, C6 Evaluation

Questions for You (15 minutes):



Discussions in groups of two students:

- Name, experience statistics (courses, scope, etc.), experience software, experiences empirical work, expectation learning outcome this course
- How many of the following questions can you answer?

Questions (to be discussed together):

- What scales for variables do you know?
- How many combinations does your bike lock have? Give reasons for the number you indicate.
- Explain the difference between the arithmetic mean and the geometric mean.
- The city of Munich offers welcome information packages with information on public transport services to new citizens. For monitoring purposes two groups of people who recently moved to Munich were surveyed: one group with and the control group without the welcome package. What statistical methods are suitable for analysing whether the mean distance travelled by public transport differs significantly between the two groups?

Learning outcomes for this course:

- You can apply important distributions, have an overview of basic concepts of probability theory
- You can formulate and test hypotheses for research
- You can read, prepare and analyse empirical data in R:
- Descriptive analysis
- Tests, regression, ANOVA

Organisation I/V, Timetable

First weeks:

- Lecture 9:45-11:15, N1090
- Introduction and exercises R 8:00-9:30, PC lab 3238

From 6 Dec:

- Lecture 8:00-9:30, 0790
- 2-3 Feb 2012: Guest lecture Dr. Tina Gehlert
- Home Work
- Timetable is on the internet and printed in the handouts

Organisation II/V, Work load

Work load	No. lectures	Hours total
Lectures, exercises Regine Gerike	17	25.5
Lectures Tina Gehlert	8	12
Total Lectures/exercises		37.5
Homework, Preparation Exam		52.5
Total		90

Time Table Applied Statistics WS 2011/12, 18/10/201



1	18.10.2011	9:45-11:15 L	Welcome and Introduction
2	25.10.2011	8:00-9:30 LE	Introduction R, Tinn-R, Math
3	25.10.2011	9:45-11:15 L	Theory of probability
	01.11.2011	All Saints Day	
4	08.11.2011	8:00-9:30 LE	Descriptive analysis with R
5	08.11.2011	9:45-11:15 L	Descriptive statistics
6	15.11.2011	8:00-9:30 LE	Real world data input and preparation
7	15.11.2011	9:45-11:15 L	Studentische Vollversammlung, distributions
8	22.11.2011	8:00-9:30 LE	Descriptive analysis with R, real world data
9	22.11.2011	9:45-11:15 L	Distributions
10	29.11.2011	8:00-9:30 LE	Reserve
11	29.11.2011	9:45-11:15 L	Inferential statistics
12	06.12.2011	8:00-9:30 L	Hypotheses testing
13	13.12.2011	8:00-9:30 L	Tests, statistical modelling
14	20.12.2011	8:00-9:30 L	ANOVA
15	10.01.2012	8:00-9:30 L	Regression
16	17.01.2012	8:00-9:30 L	Reserve
17	24.01.2012	8:00-9:30 L	Repetition
	02.02.2012	Tina Gehlert	Hypothesis-driven data analysis in transport
	03.02.2012	Tina Gehlert	Hypothesis-driven data analysis in transport
	07.02.2012	10:00-11:00	Exam

Organisation III/V

Literature in the course reserve:

- Montgomery, Douglas C., Runger, George C. (2003) Applied statistics and probability for engineers, 0702/MAT 600f 07.2003 B 29
- Sá, Joaquim P. Marques -de (2007) Applied statistics using SPSS, STATISTICA, MATLAB and R, 1002/DAT 307f 2007 A 5840(2)
- Muenchen, Robert A. (2009) R for SAS and SPSS users, 040090412141 / 0002/MAT 620f 2010 A 2273
- Washington, Simon (2003) Statistical and econometric methods for transportation data analysis, 040006760327 / 0002/MAT 902f 2008 A 2250
- Crawley, Michael J. (2009) The R book, 040090435717 / 0003/MAT 620f 2010 L 82+3

Link to additional material: <http://www.transportation.bv.tum.de/>

Organisation IV/V

Please register with the PC labs soon.

You also need a mytum address for accessing certain TUM pages and registering for languages courses.

Please do this in person in room 3175 with Mr. Tessmann / Mr. Dietel. Office hours: Mon through Thu 9:00 – 16:00 and Fri 9:00 – 13:00

You find the room on the 3rd floor. Access through the glass door saying “Lehrstuhl für Datenverarbeitung”. The next glass door on the right hand side is the office of Mr. Tessmann / Ms. Schneider.

You need: your (validated) matriculation, passport and matriculation no. and the filled form “Application for the issue of a login”

Website of the PC lab: www.cip.bv.tum.de

Organisation V/V

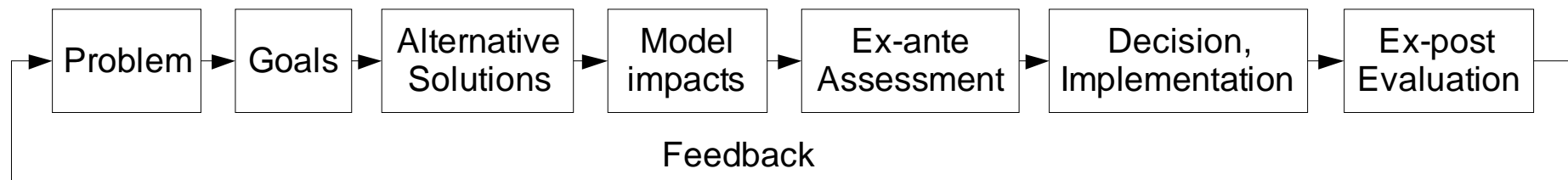
- Pocket Calculator
- Login CIP-Pool
- Software: R, Access/Excel/Office

- Exam:
- After 1 semester
- Written test, 60 minutes
- Allowed material: Pocket Calculator, one hand-written A4-page (both sides)

Transport Engineers and Statistics

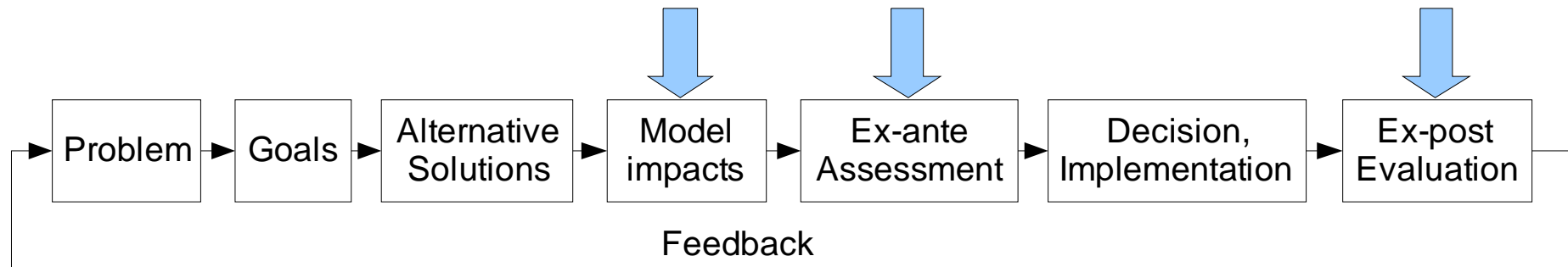
A transport engineer is someone who solves problems of interest to society by the efficient application of scientific principles by

- Refining existing methods and products
- Designing new methods and products



Transport Engineers and Statistics

- A transport engineer is someone who solves problems of interest to society by the efficient application of scientific principles by
- Refining existing methods and products
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Statistics is not only important for engineers but also for everyday life:

- Lottery
- Game of cards
- Game of dice and other games of chance
- Gasoline mileage performance of your car
- Location decision
- Etc.

Statistics:

- collect the data,
- analyse it,
- interpret the results,
- present the results.

Descriptive statistics: Summarise and analyse data:

- Graphical displays
- Tabular description
- Summary statistics

Inferential statistics: Inferences concerning some unknown aspect of a population, model patterns in the data

- Hypothesis testing: answers to yes/no questions
- Estimation: estimates of numerical characteristics
- Correlation: descriptions of association
- Regression: modelling of relationships

Probability: Likelihood or chance that something is the case or will happen;
probability theory: representation of probabilistic concepts in formal terms

Thank you for your attention.

Regine Gerike

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