**Decision Analysis for and Forecasting for Agricultural Development**

**Master Course Outline**

**Taught in … semester (dates: …)**

*(about 60 hours in class [15\*4 hour class] and 120 outside class [projects etc.])*

*This from the Uni-Bonn Institute of Computer Science as a model* [*https://cg.cs.uni-bonn.de/en/teaching/ss-2018/lecture-mrfs-for-vision-and-graphics/*](https://cg.cs.uni-bonn.de/en/teaching/ss-2018/lecture-mrfs-for-vision-and-graphics/)

*Andrew Heiss* [*https://datavizm20.classes.andrewheiss.com/*](https://datavizm20.classes.andrewheiss.com/)

Class participation **50%**

* Attendance
* Short weekly tests for seeing how up to speed people are
* Track GIT activity

Group work **50%**

* Paper
* Repository
* Code
* All do weekly reading/listening assignments and teams lead short related discussion

# Introduction (Readings and Lectures):

* What? Experiential course. You (students) will be leading discussions and projects.
* So What? Becoming a critical thinker and generating useful forecasts for decision makers in agricultural development.
* Now What? Build a working model of an agricultural development decision
* Introduce idea of group work etc. (choose group / begin to think about a decision).

# Group Project

* Decision Identified
* Collaborate with decision makers on decision model development (qualitative)
* Generate model code from qualitative model and parameterize (quantitative step)
* Git repo with code

# Collaboration (Git, Readings and Lectures):

* STEP 1 Start simple with own repository only and work on it alone.
* STEP 2 start to collaborate on something and learn the complicated parts of that.
* All project work takes place in GIT
* ~ 5,000 word paper (written in RMarkdown, examples of best practices, word counts, spell check, grammar check in github.com/hortibonn/Plotting-High-Dimensional-Data)

**Seminar 1:** Scientific process / publications / careers (with ChillR and Horticulture Project MSc course)

**Seminar 2:** Citation management software / Literature sources (with Horticulture Project Module)

**Seminar 3:** Writing style etc. (with ChillR and Horticulture Project MSc course)

**Seminar 4:** How to use RStudio, R (together with ChillR MSc course)

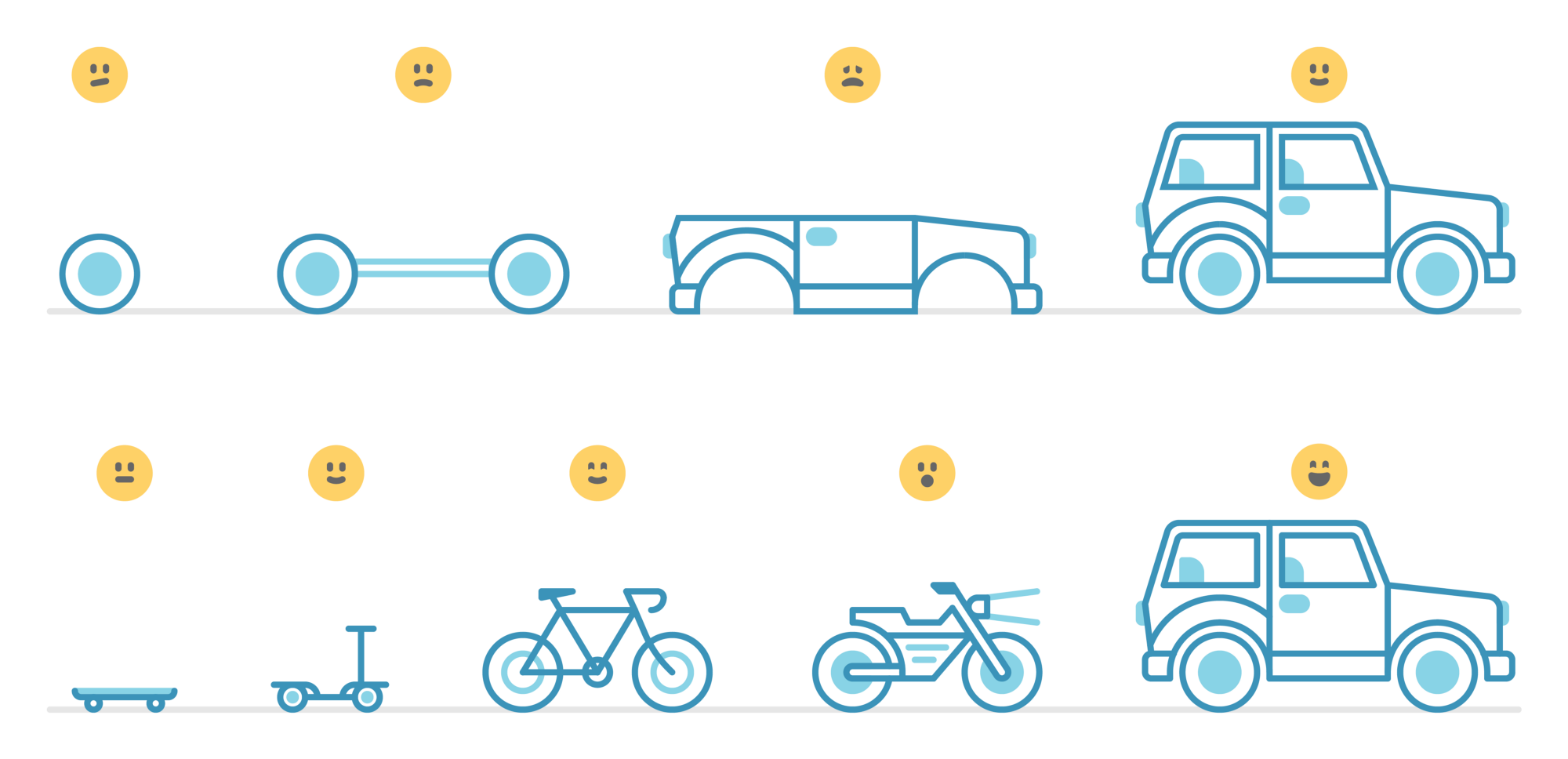
**Seminar 5:** How to use GitHub, git, Rmarkdown (together with ChillR MSc course)

# Decision Analysis

* Overview of DA
* Brief examples (Vietnam…, Uganda, Calluna…)
* Hubbard (selected chapters from ‘How to Measure Anything’)
* Howard (selected chapters from ‘Decision Analysis’ and recorded talks)

# Decision Models (Overview)

* Making a solid business case for the model before programming
* Step1. Start with a skateboard… then move on to other steps



**Seminar:** Causal model / diagram / Impact pathway / Theory of change

# Biases (Readings and Lectures):

* Kahneman (selected work from ‘Thinking Fast and Slow’)
* Rosling (TED Talks / selected work from ‘Factfulness’)
* Ken Robinson (TED Talks / selected work from ‘Out of Our Minds’)

**Seminar:** Calibration Training (lead by team)

# Bayesian thinking

* All follow ‘Learning Bayesian Statistics’ podcast
* Selected reading from ‘The theory that would not die’
* R. McElreath (selected reading from ‘Statistical Rethinking’)
* Betancourt’s work (selected blogs, talks, git repos, Stan, HCMC)

**Assignments:**

1. Greenland, Sander, Judea Pearl, and James M. Robins. “Causal Diagrams for Epidemiologic Research.” *Epidemiology* 10, no. 1 (1999): 37–48*.*
2. *“Yesterday, I gave an easy intro to causal diagrams for some MA students […] bc it contains not a single equation to scare a student with.” – Richard McElreath*
3. NOVA: Prediction by the Numbers. 2018. With the science of forecasting flourishing, this documentary explores how predictions inform our lives and statistics and algorithms' reliability. **52m video** <https://www.dailymotion.com/video/x6fi9b3>

# Model Programming (Coding and programming in R)

* R packages decisionSupport (walk through a vignette or two)
* RSTAN, Other modeling programs - Betancourt’s work (selected blogs, talks, git repos, Stan, HCMC)
* Yihui (markdown etc.)
* **Assignments:**
* 1. “episode 3, with Colin Carroll. He mentions Tom Rainforth's thesis.” – Alex Andorra (about his interview with Colin Carol on the podcast Learning Bayesian Statistics)
* Rainforth, Tom. “Automating Inference, Learning, and Design Using Probabilistic Programming.” Doctor of Philosophy, University of Oxford, 2017.