Dealing with Data:

Data ecosystems and wicked problems; supporting "students as researchers" in complex data environments

Presented by ***Edinburgh Living Lab***

- *Ewan Klein – School of Informatics*
- *James Stewart – STIS*
- *Arno Verhoeven – School of Design; ECA*

August 31, 2015 – University of Edinburgh

Data ecosystems and wicked problems: overview

Edinburgh Living Lab

- what is a Living Lab?
- how does it work?
- why is this work challenging? “Wicked” problems (Rittel & Webber, 1973)

Students as “researchers and practitioners”

- Design for Informatics (DESI11027); a postgraduate course with design students (MA) and informatics students (Msc)
- how do students manage “wicked” problems
- how to translate various types of data into persuasive information using design principles through a Living Lab environment

Case studies

- what do our students' projects reveal about challenges to working with data?
- tools for data transformation
- concerns about data storage and security
- issues of data ethics

Discussion

Data ecosystems and wicked problems: overview

Edinburgh Living Lab

- what is a Living Lab?
- how does it work?
- why is this work challenging? “Wicked” problems (Rittel & Webber, 1973)

Students as “researchers and practitioners”

- Design for Informatics (DESI11027); a postgraduate course with design students (MA) and informatics students (Msc)
- how do students manage “wicked” problems
- how to translate various types of data into persuasive information using design principles through a Living Lab environment

Case studies

- what do our students' projects reveal about challenges to working with data?
- tools for data transformation
- concerns about data storage and security
- issues of data ethics

Discussion

What is a Living Lab?

An infrastructure of people and technology, engaging potential users/customers/citizens in innovation processes to support social change and economic development

- Experiments carried out in natural everyday settings with real people and complex settings to support policy, research and commercial goals.
- Uses design thinking and evidence-based evaluation based on multiple methods – especially 'instrumented city' and citizen science approaches.
- Not based on single projects – it is an infrastructure of people, methods and and technology.
- In the Living Lab, the 'users' are also the creators

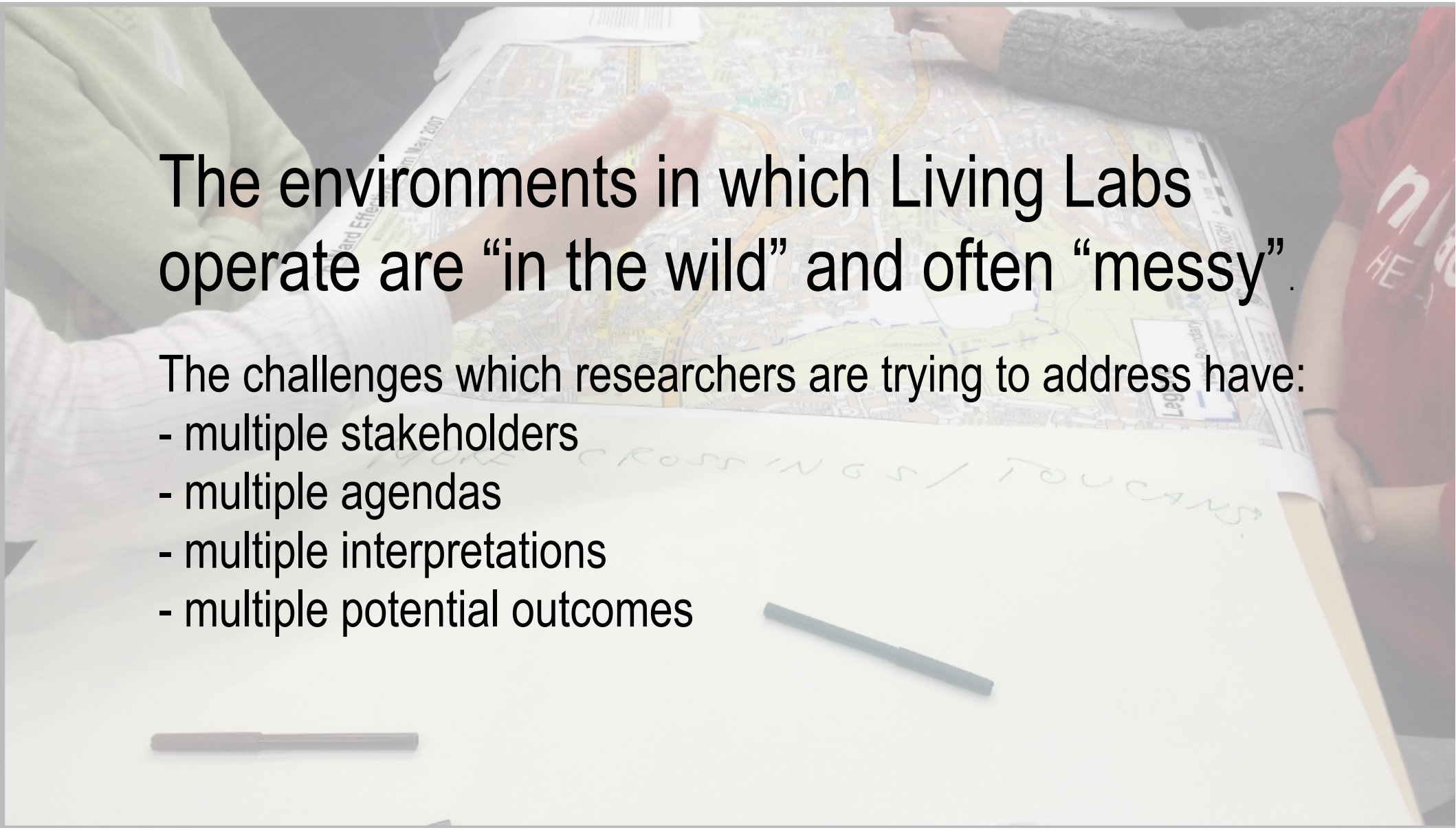
What is the Edinburgh Living Lab?

Member of
European Network of Living Labs

http://edinburghlivinglab.org

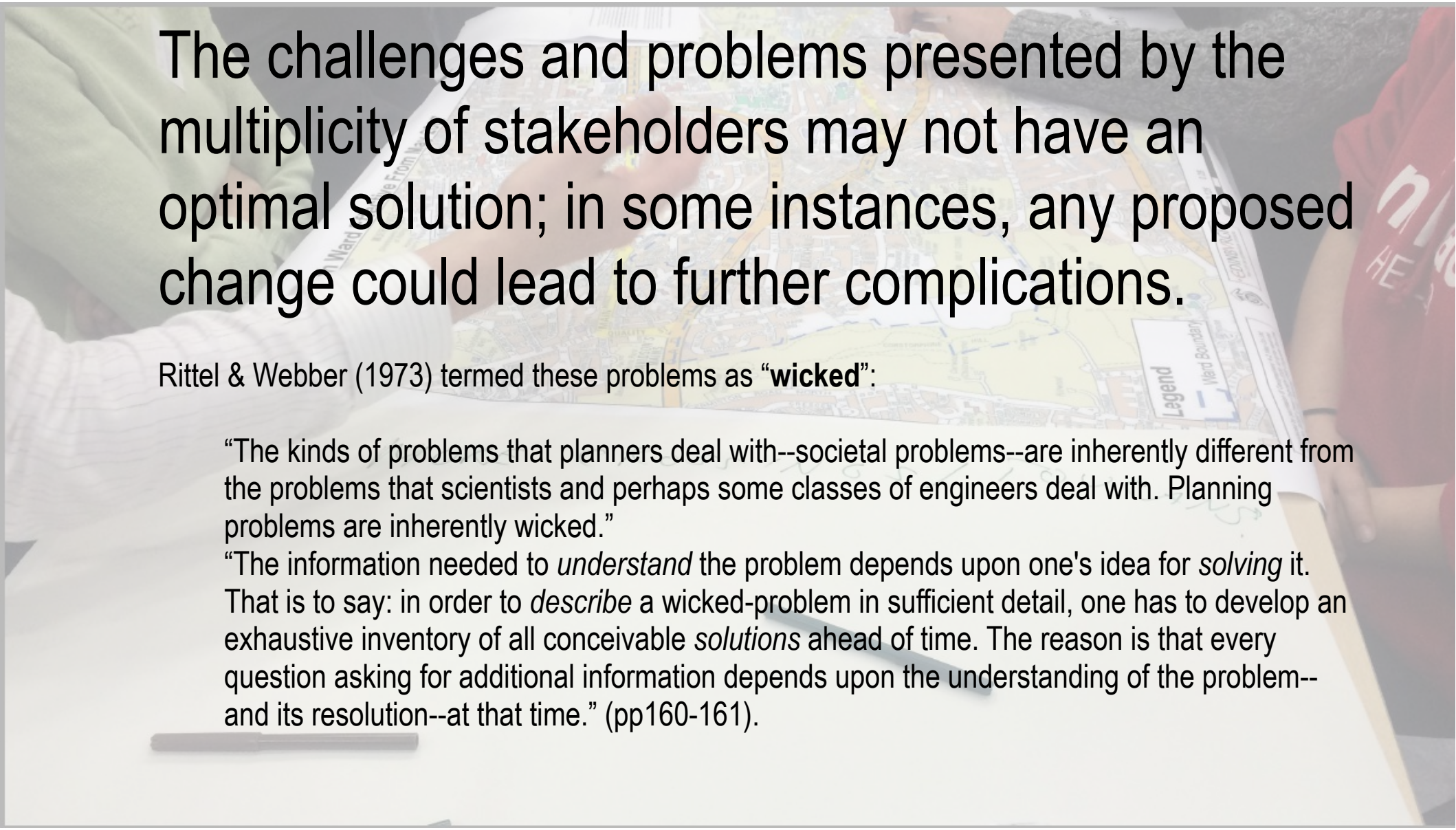
We are a nascent research partnership between the City of Edinburgh (CEC) and the University of Edinburgh, amongst others.

We work with various stakeholders within CEC to deliver a community based postgraduate course called Design for Informatics; future course called Data, Design & Society to be delivered to undergraduate students in 2015/16.



The environments in which Living Labs operate are “in the wild” and often “messy”.

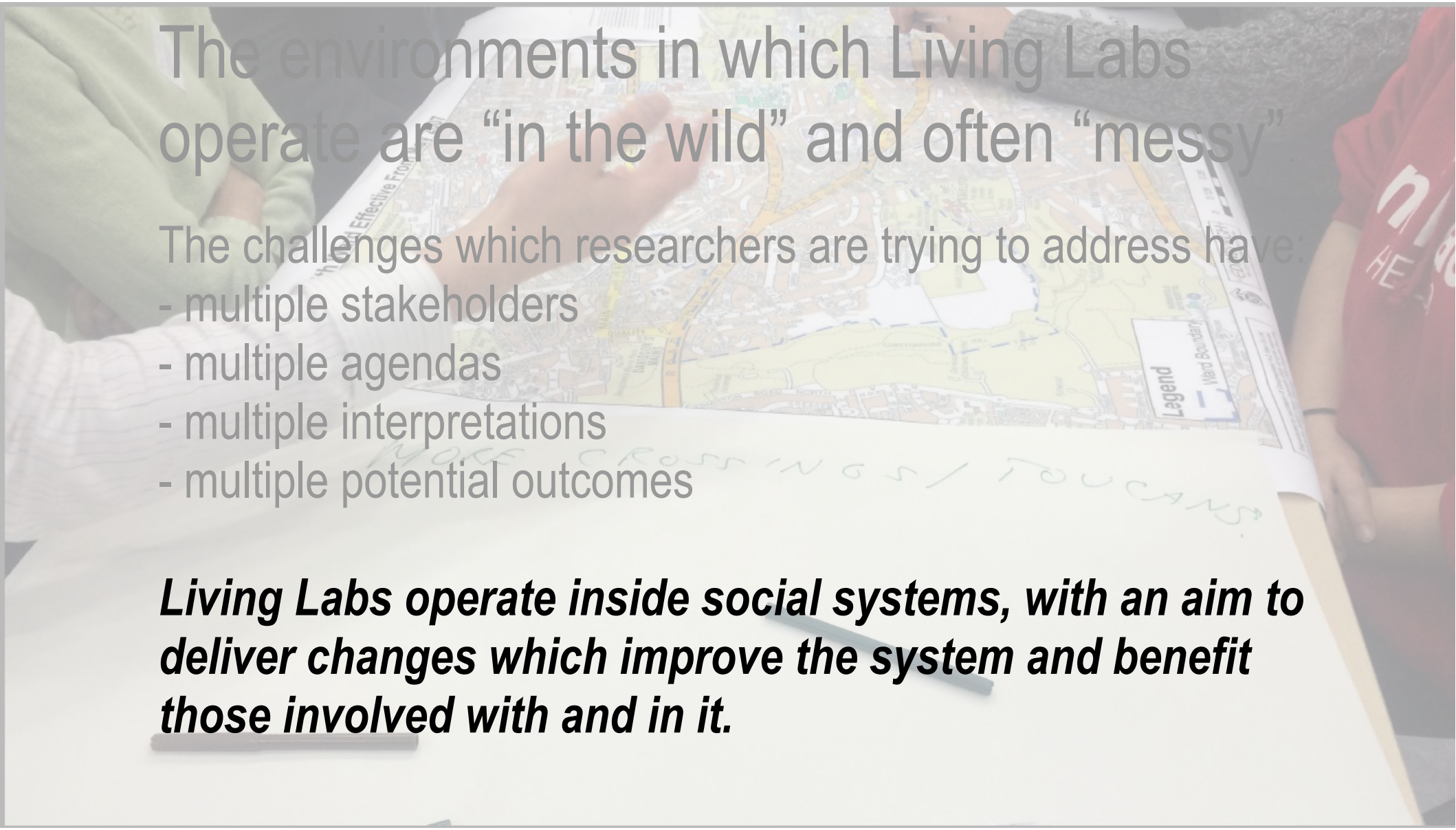
The challenges which researchers are trying to address have:
- multiple stakeholders
- multiple agendas
- multiple interpretations
- multiple potential outcomes



The challenges and problems presented by the multiplicity of stakeholders may not have an optimal solution; in some instances, any proposed change could lead to further complications.

Rittel & Webber (1973) termed these problems as "**wicked**":

> "The kinds of problems that planners deal with--societal problems--are inherently different from the problems that scientists and perhaps some classes of engineers deal with. Planning problems are inherently wicked."
> "The information needed to *understand* the problem depends upon one's idea for *solving* it. That is to say: in order to *describe* a wicked-problem in sufficient detail, one has to develop an exhaustive inventory of all conceivable *solutions* ahead of time. The reason is that every question asking for additional information depends upon the understanding of the problem--and its resolution--at that time." (pp160-161).



The environments in which Living Labs operate are “in the wild” and often “messy”

The challenges which researchers are trying to address have:

- multiple stakeholders
- multiple agendas
- multiple interpretations
- multiple potential outcomes

Living Labs operate inside social systems, with an aim to deliver changes which improve the system and benefit those involved with and in it.

Data collected within a Living Lab framework is often mixed:

- involving datasets which already exist
- requires collecting new quantitative data on behaviours, patterns and trends across systems
- requires collecting new qualitative data from people invested in the problem or challenge

However, framing the appropriate context for collecting data is open to interpretation and debate (making it "wicked")

Edinburgh Living Lab

- what is a Living Lab?
- how does it work?
- why is this work challenging? “Wicked” problems (Rittel & Webber, 1973)

Students as “researchers and practitioners”

- Design for Informatics (DESI11027); a postgraduate course with design students (MA) and informatics students (Msc)
- how do students manage “wicked” problems
- how to translate various types of data into persuasive information using design principles through a Living Lab environment

Case studies

- what do our students' projects reveal about challenges to working with data?
- tools for data transformation
- concerns about data storage and security
- issues of data ethics

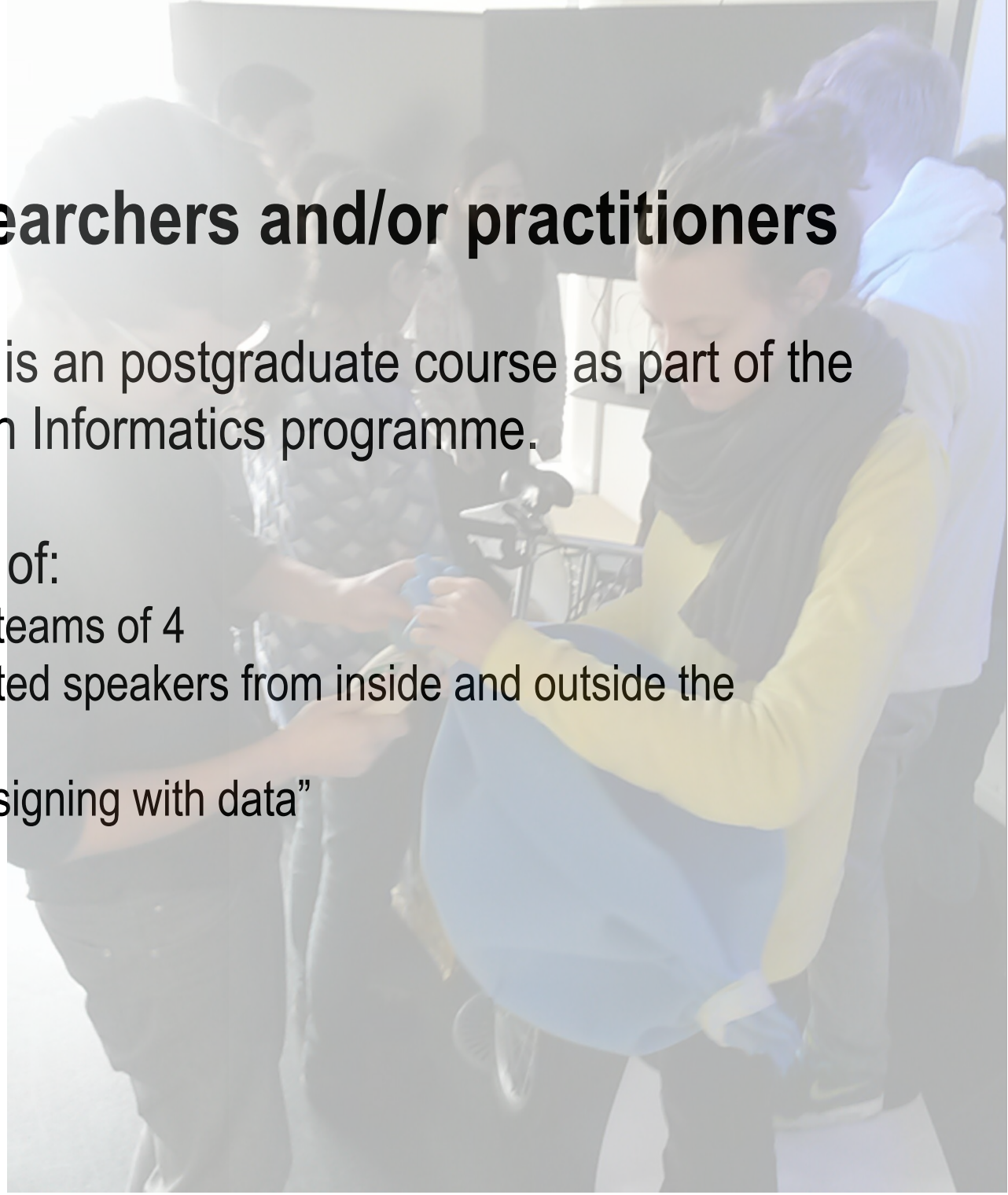
Discussion

Students as researchers and/or practitioners

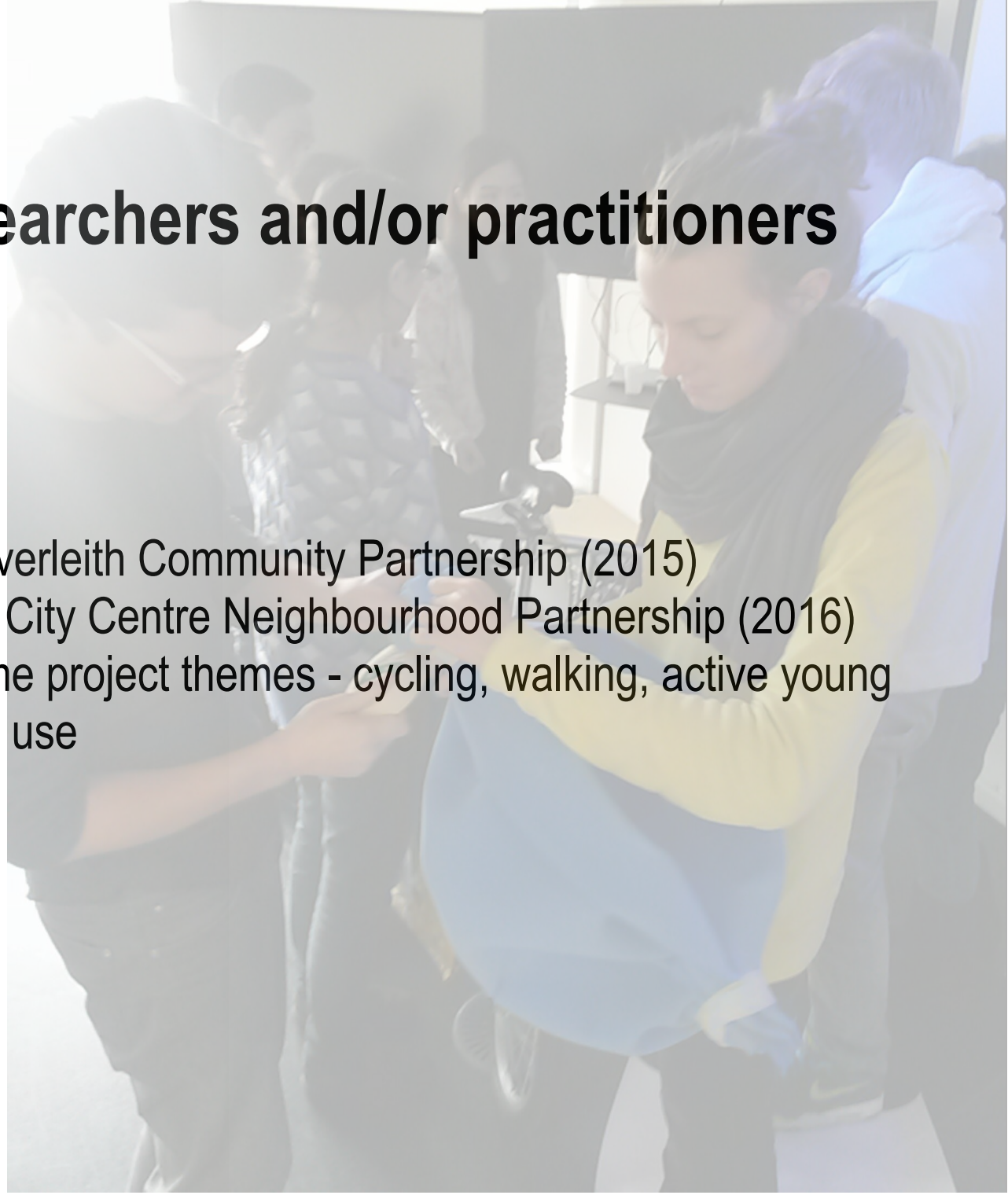
Design for Informatics is an postgraduate course as part of the interdisciplinary Design Informatics programme.

2014 cohort consisted of:

- 22 students 50/50 split, teams of 4
- 3 staff as mentors + invited speakers from inside and outside the University
- Course emphasis is “designing with data”

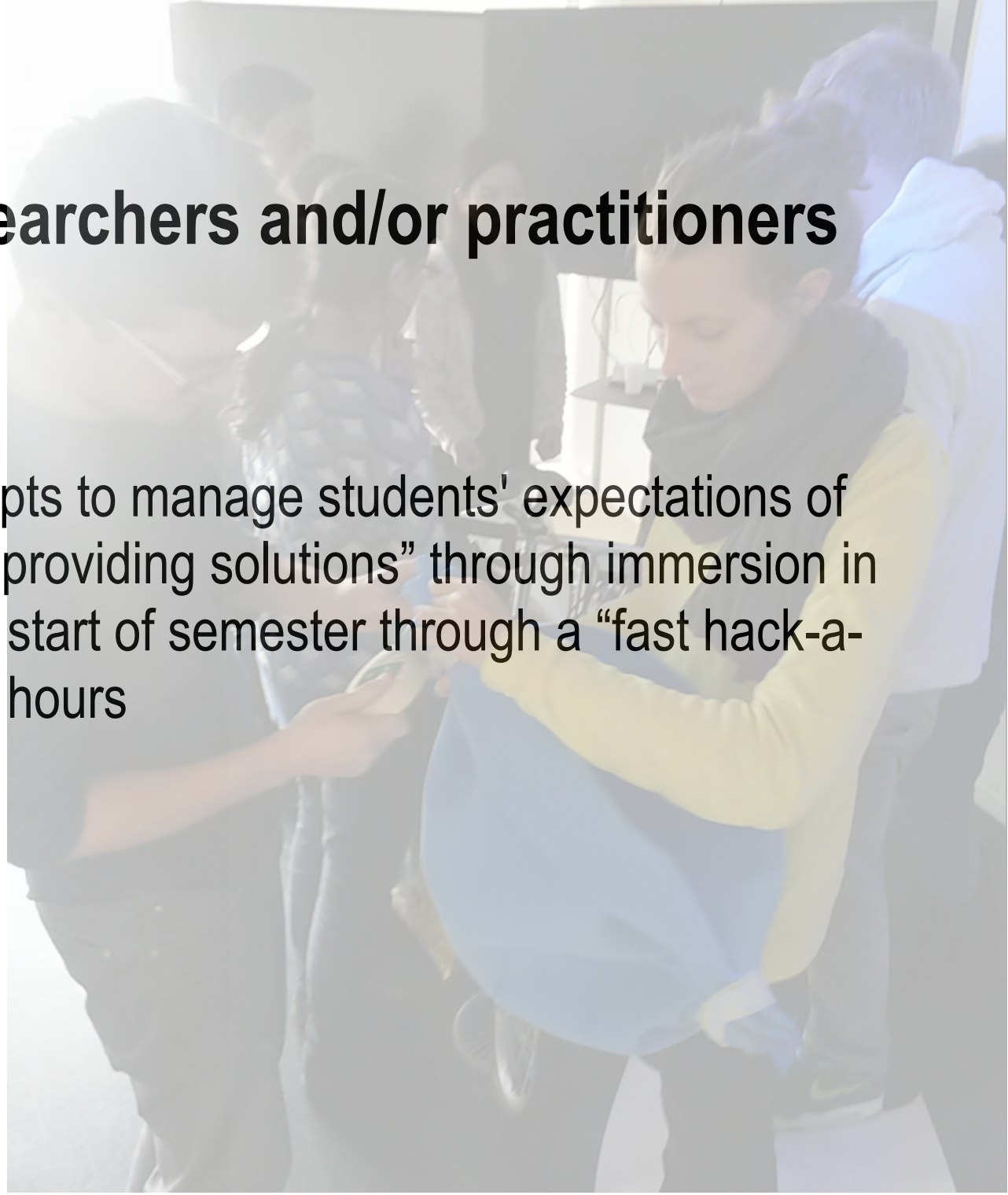


Students as researchers and/or practitioners



- inaugural project with Inverleith Community Partnership (2015)
- forthcoming project with City Centre Neighbourhood Partnership (2016)
- Community goals become project themes - cycling, walking, active young people and green space use

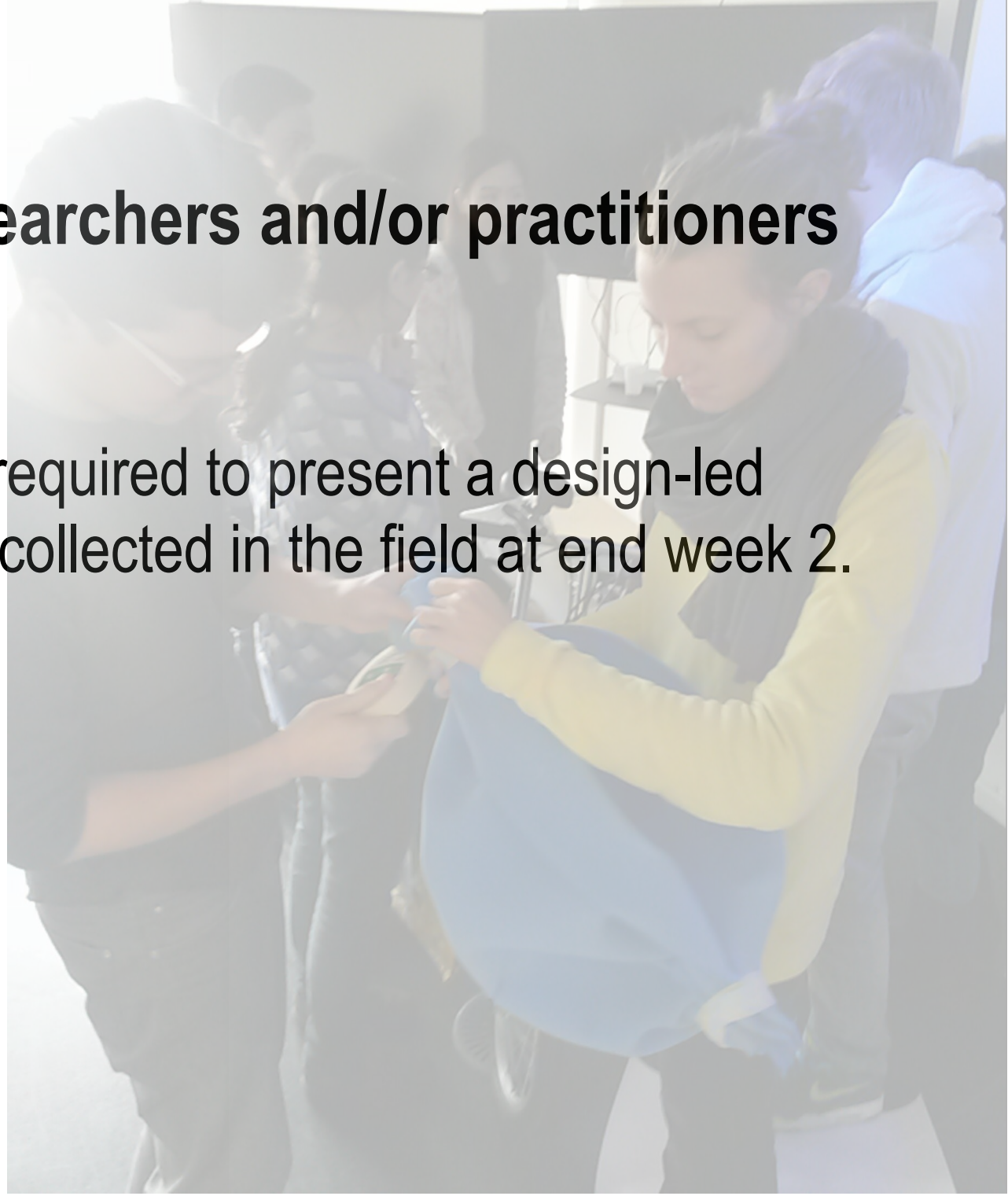
Students as researchers and/or practitioners

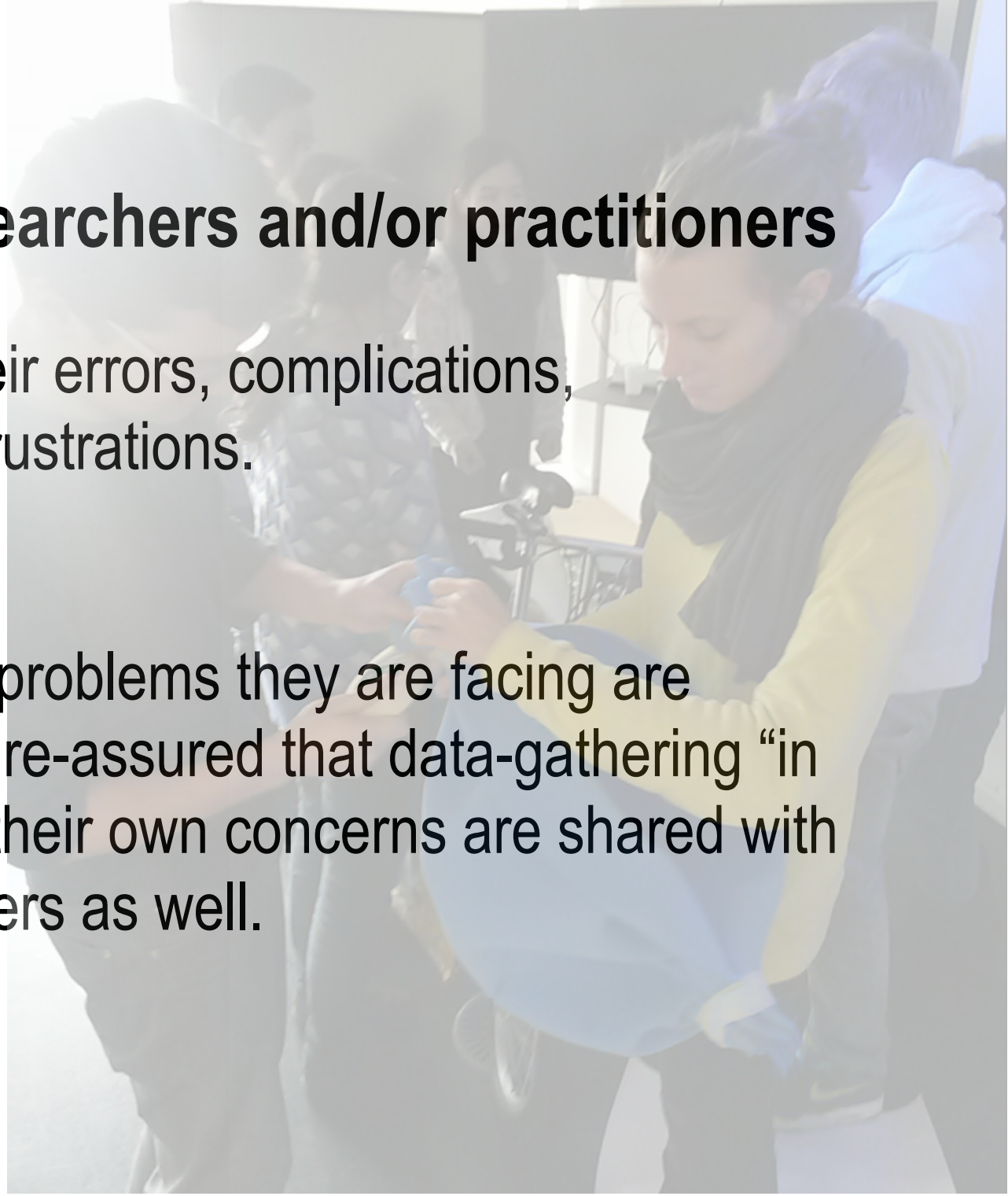


Course syllabus attempts to manage students' expectations of “solving problems” or “providing solutions” through immersion in the project sites at the start of semester through a “fast hack-a-thon” which last for 48 hours

Students as researchers and/or practitioners

Student teams are required to present a design-led proposal from data collected in the field at end week 2.

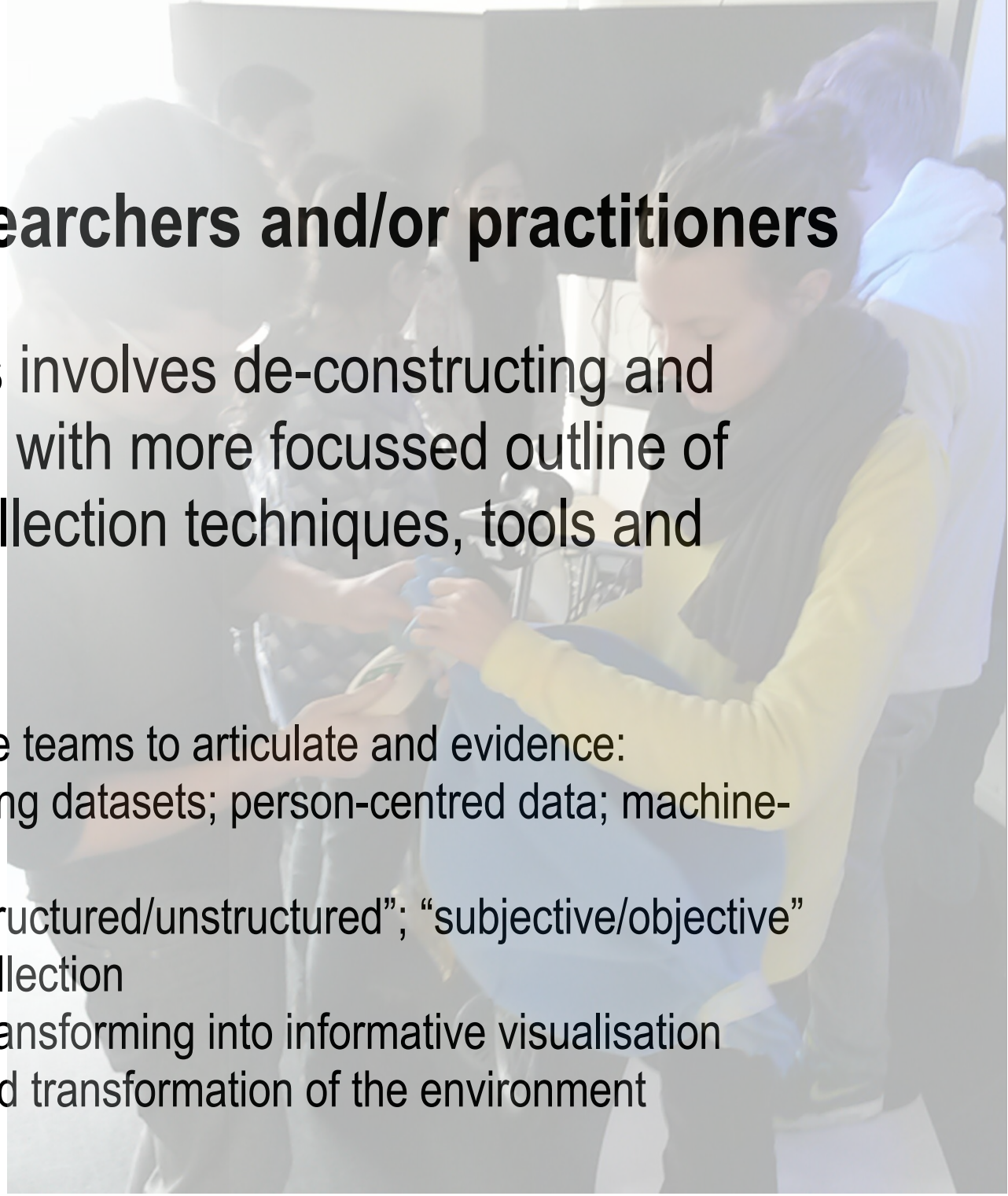




Students as researchers and/or practitioners

Students outline their errors, complications, inadequacies and frustrations.

We outline that the problems they are facing are “wicked”. They are re-assured that data-gathering “in the wild” is messy; their own concerns are shared with seasoned researchers as well.



Students as researchers and/or practitioners

Remaining 9 weeks involves de-constructing and renewing proposals with more focussed outline of appropriate data collection techniques, tools and methods.

Final presentations require teams to articulate and evidence:

- 3 sources of data (existing datasets; person-centred data; machine-centred data)
- data tension through “structured/unstructured”; “subjective/objective”
- methods and tools of collection
- methods and tools for transforming into informative visualisation
- final proposed design-led transformation of the environment

Edinburgh Living Lab

- what is a Living Lab?
- how does it work?
- why is this work challenging? “Wicked” problems (Rittel & Webber, 1973)

Students as “researchers and practitioners”

- Design for Informatics (DESI11027); a postgraduate course with design students (MA) and informatics students (Msc)
- how do students manage “wicked” problems
- how to translate various types of data into persuasive information using design principles through a Living Lab environment

Case studies

- what do our students' projects reveal about challenges to working with data?
- tools for data transformation
- concerns about data storage and security
- issues of data ethics

Discussion

Case Studies

6 teams worked in the Inverleith Neighbourhood; all teams had assumed different approaches to the initial challenge;

How to encourage more walking and cycling in Inverleith?

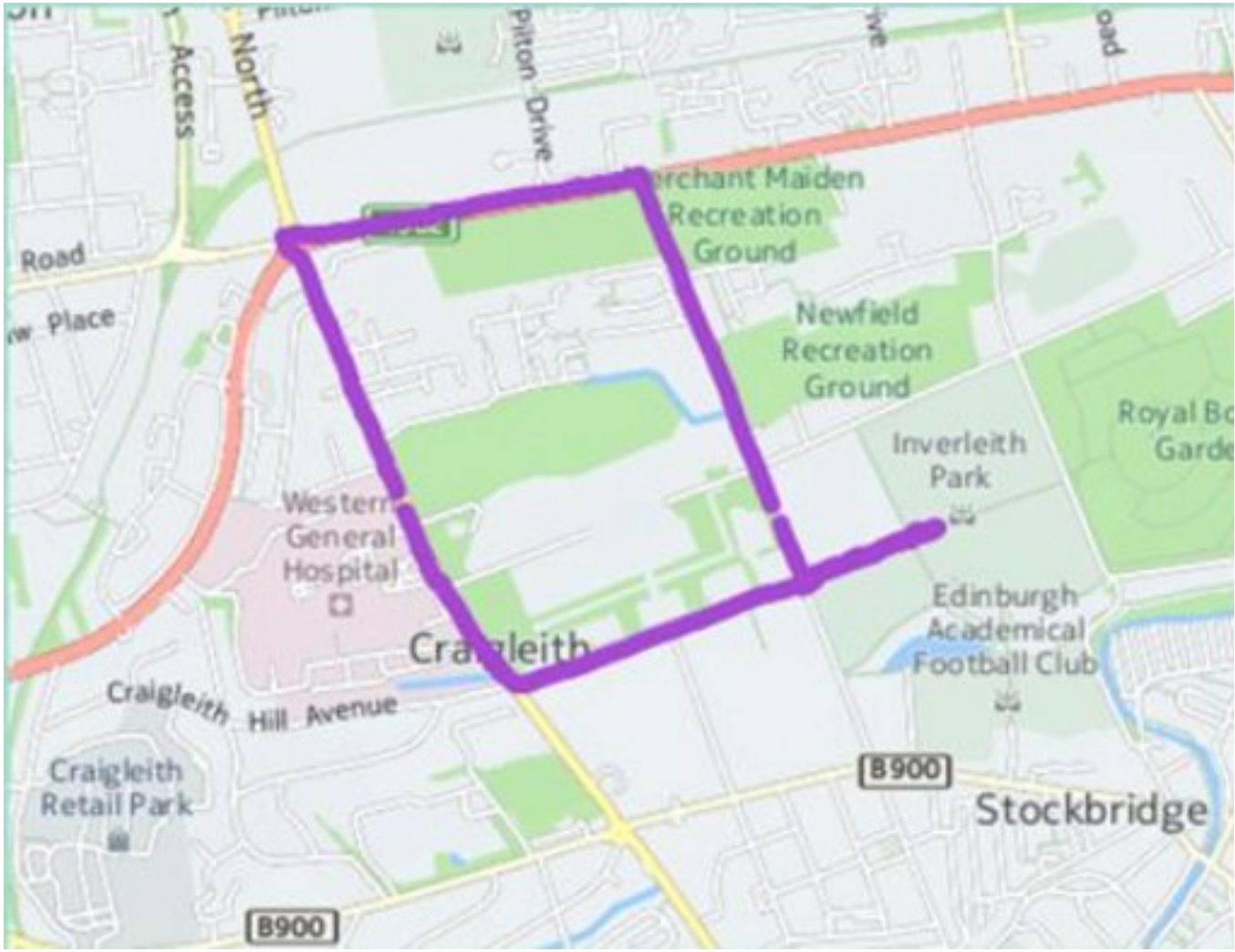
We present 2 projects for discussion today

“Brains on Bikes”

- assessing fear and safety around Inverleith cyclepath network

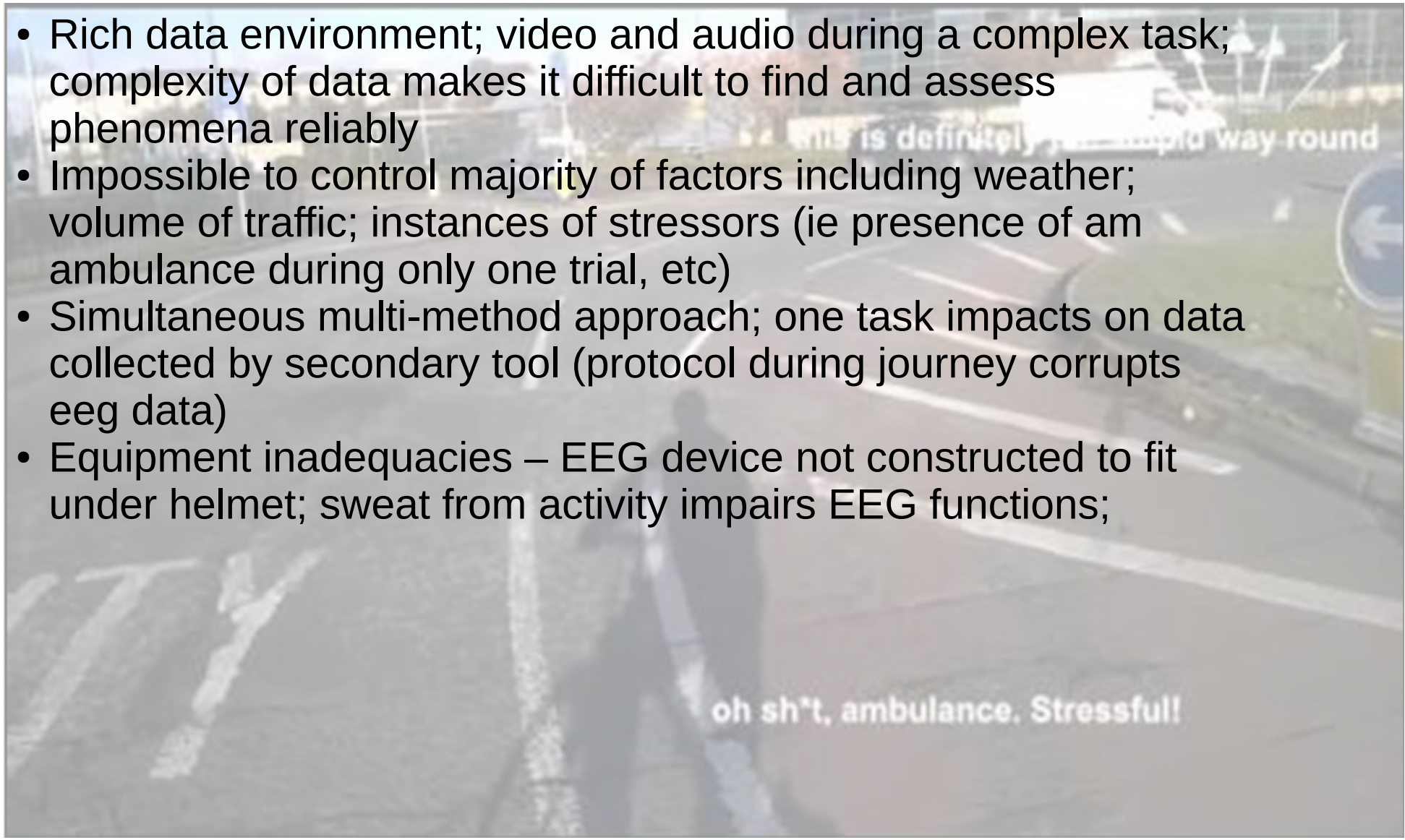
Brains on Bikes

Brains on Bikes



Brains on Bikes

Brains on Bikes – students notes



- Rich data environment; video and audio during a complex task; complexity of data makes it difficult to find and assess phenomena reliably
- Impossible to control majority of factors including weather; volume of traffic; instances of stressors (ie presence of am ambulance during only one trial, etc)
- Simultaneous multi-method approach; one task impacts on data collected by secondary tool (protocol during journey corrupts eeg data)
- Equipment inadequacies – EEG device not constructed to fit under helmet; sweat from activity impairs EEG functions;

WayOkay

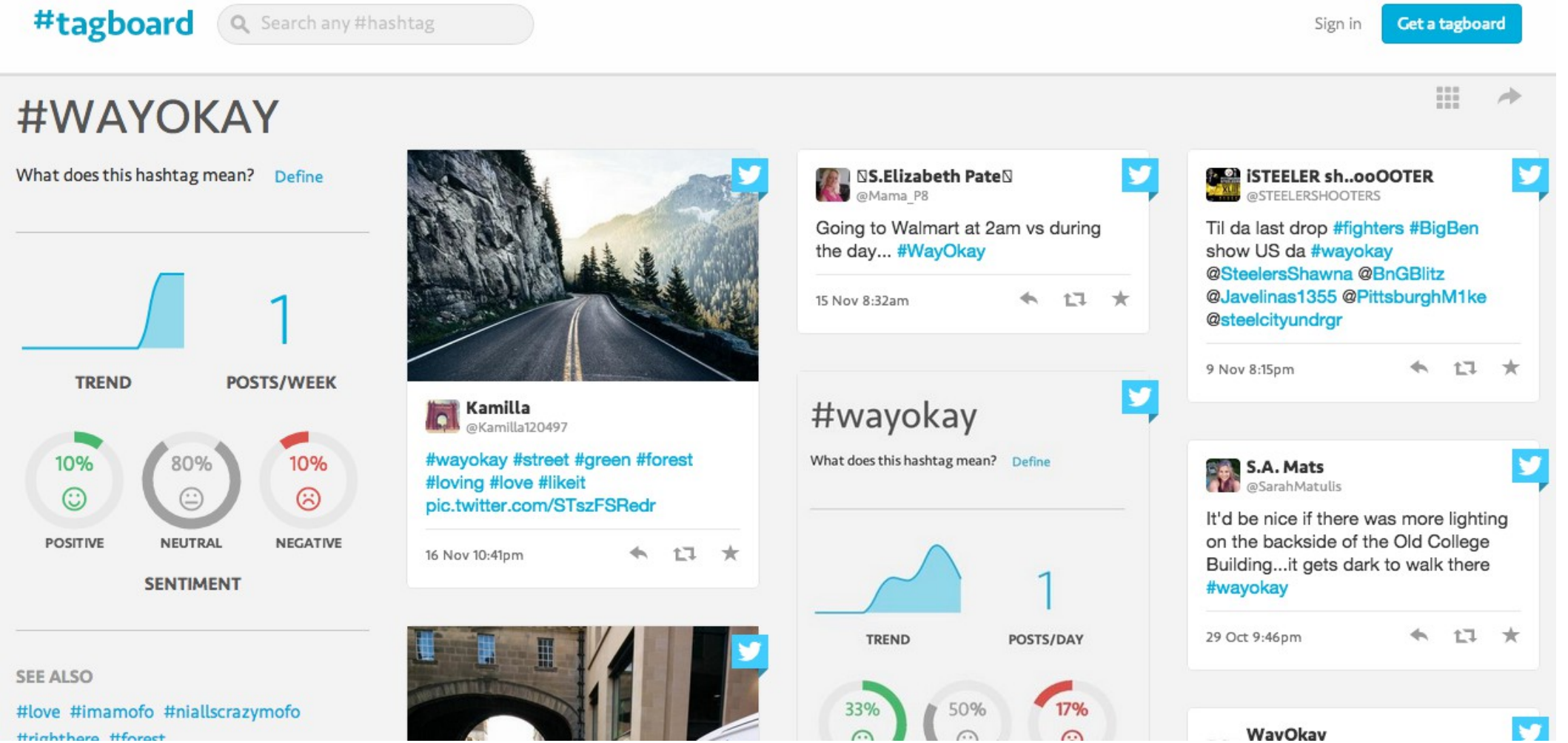
– Perceptions of road safety

WayOkay

Using social media to provide initial scope

WayOkay

52% respondents - too dangerous to cycle on Edinburgh streets



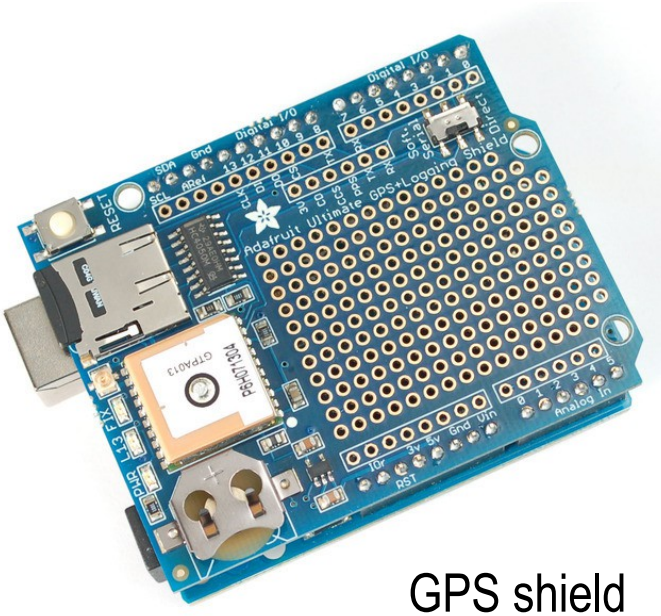
WayOkay

- but where, and when is it dangerous?

- better contextual recording methods were required.

Arduino YÚN board

Pressure sensors

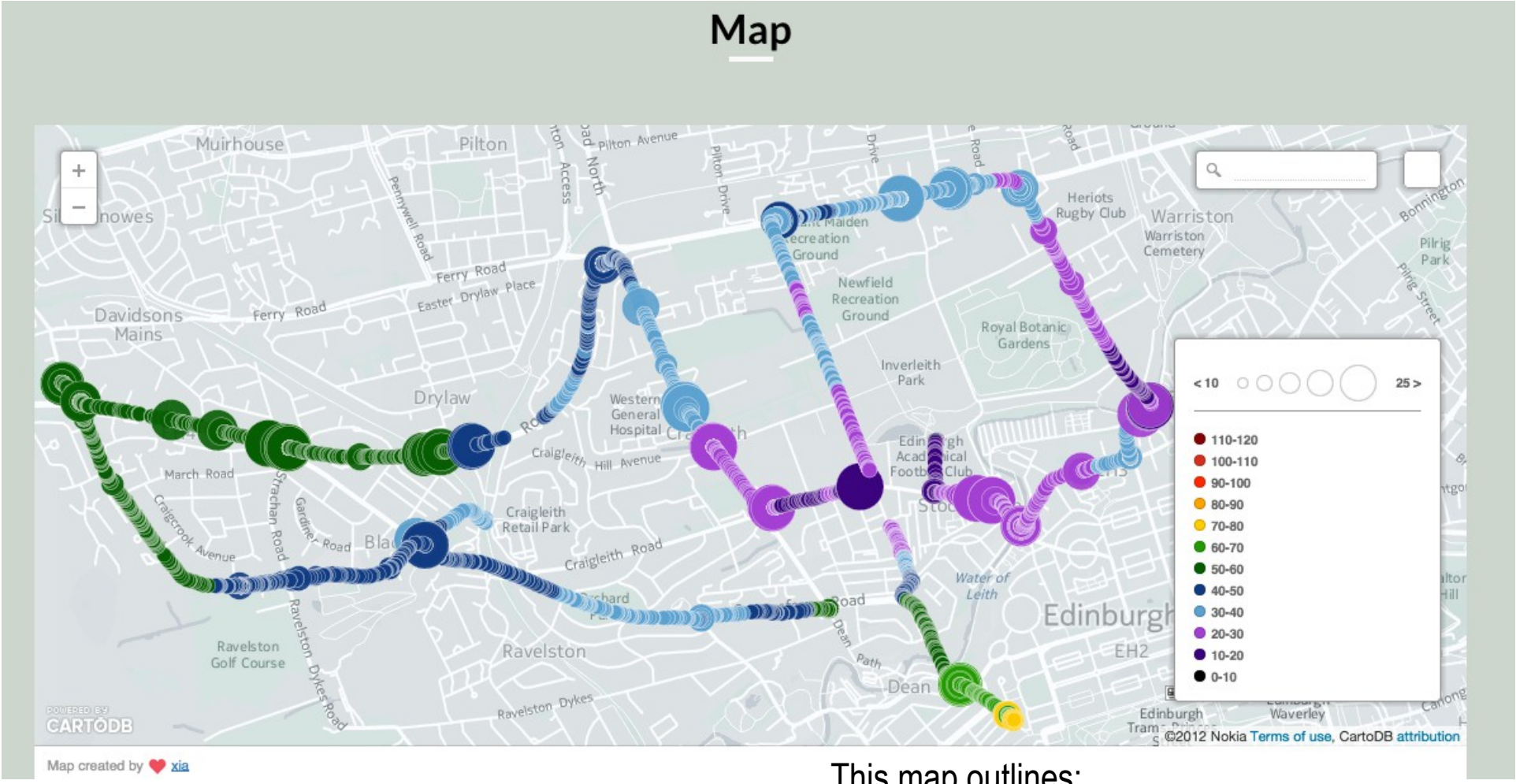


GPS shield

WayOkay

WayOkay

WayOkay



This map outlines:

- Total of cycle routes taken by the participants
- Bigger dots show levels of high pressure
- Colours show levels of altitude

WayOkay

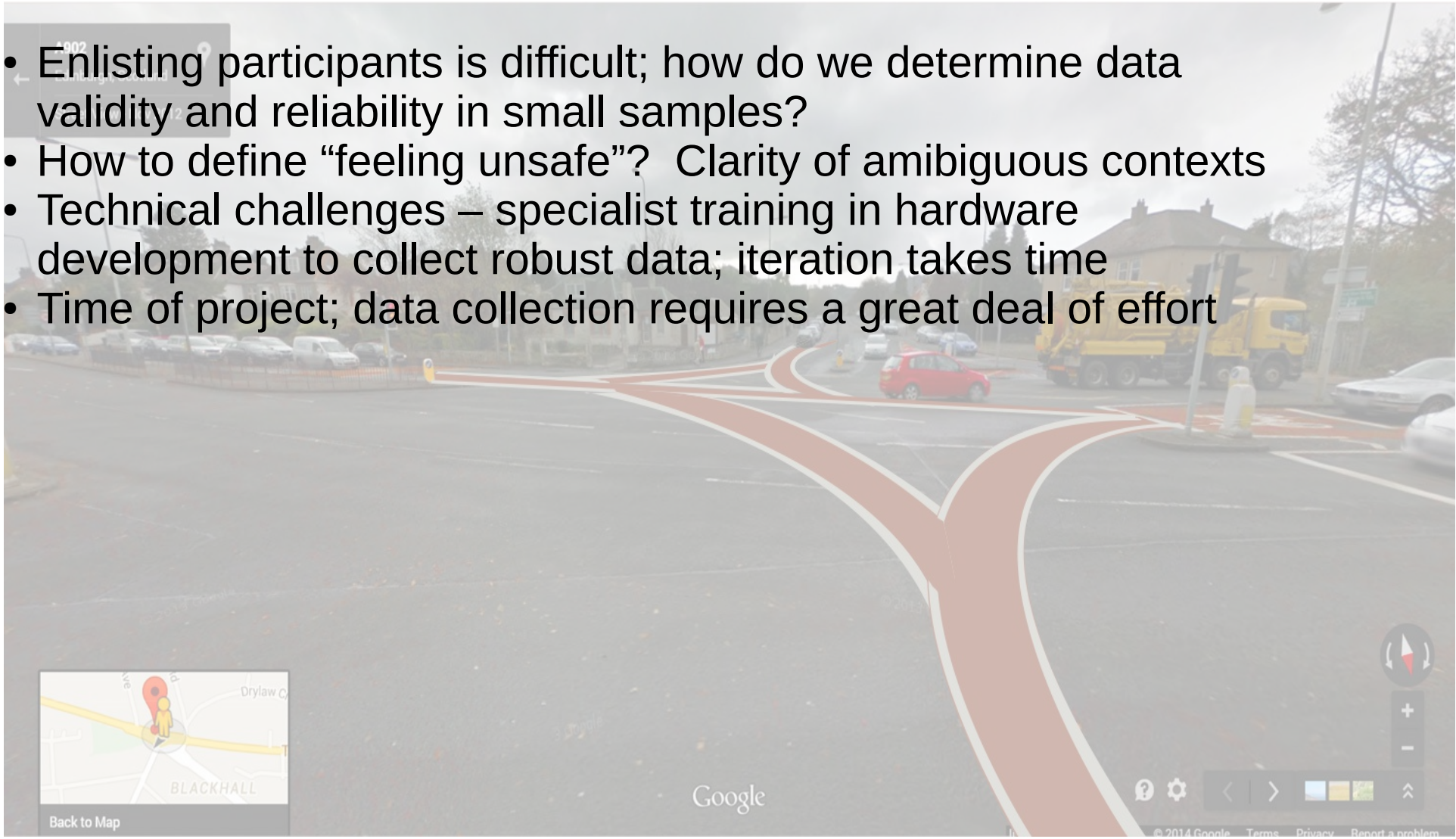

A902
Edinburgh, Scotland
Street View - Nov 2012
Drylaw
BLACKHALL
Back to Map
Google
Google street views of *unsafe* places in Inverleith
Image capture: Nov 2012 © 2014 Google Terms Privacy Report a problem

WayOkay

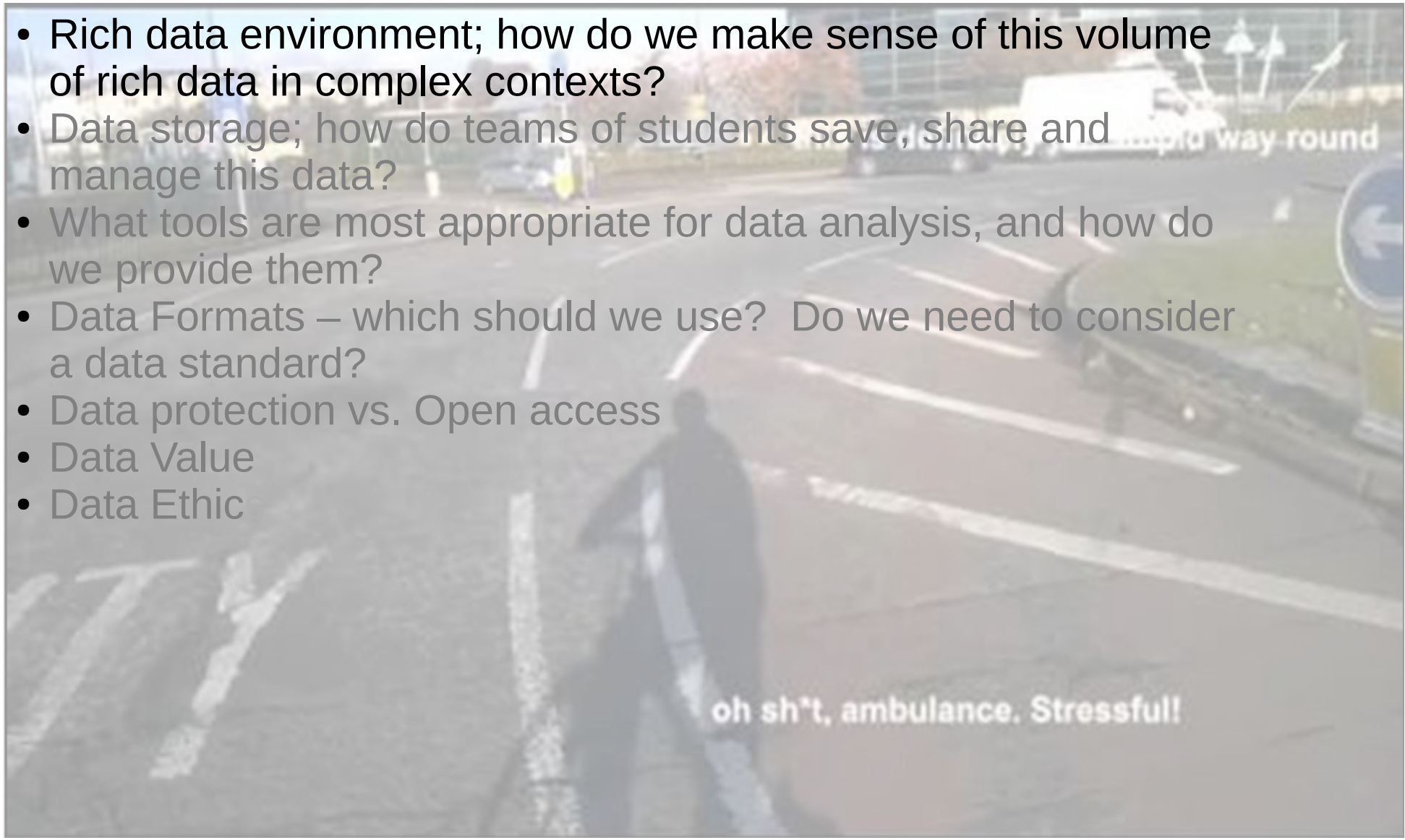

A902
Edinburgh, Scotland
Street View - Nov 2012
Drylaw
BLACKHALL
Back to Map
Google
© 2014 Google
Terms
Privacy
Report a problem

WayOkay – students notes

- Enlisting participants is difficult; how do we determine data validity and reliability in small samples?
- How to define “feeling unsafe”? Clarity of amibiguous contexts
- Technical challenges – specialist training in hardware development to collect robust data; iteration takes time
- Time of project; data collection requires a great deal of effort

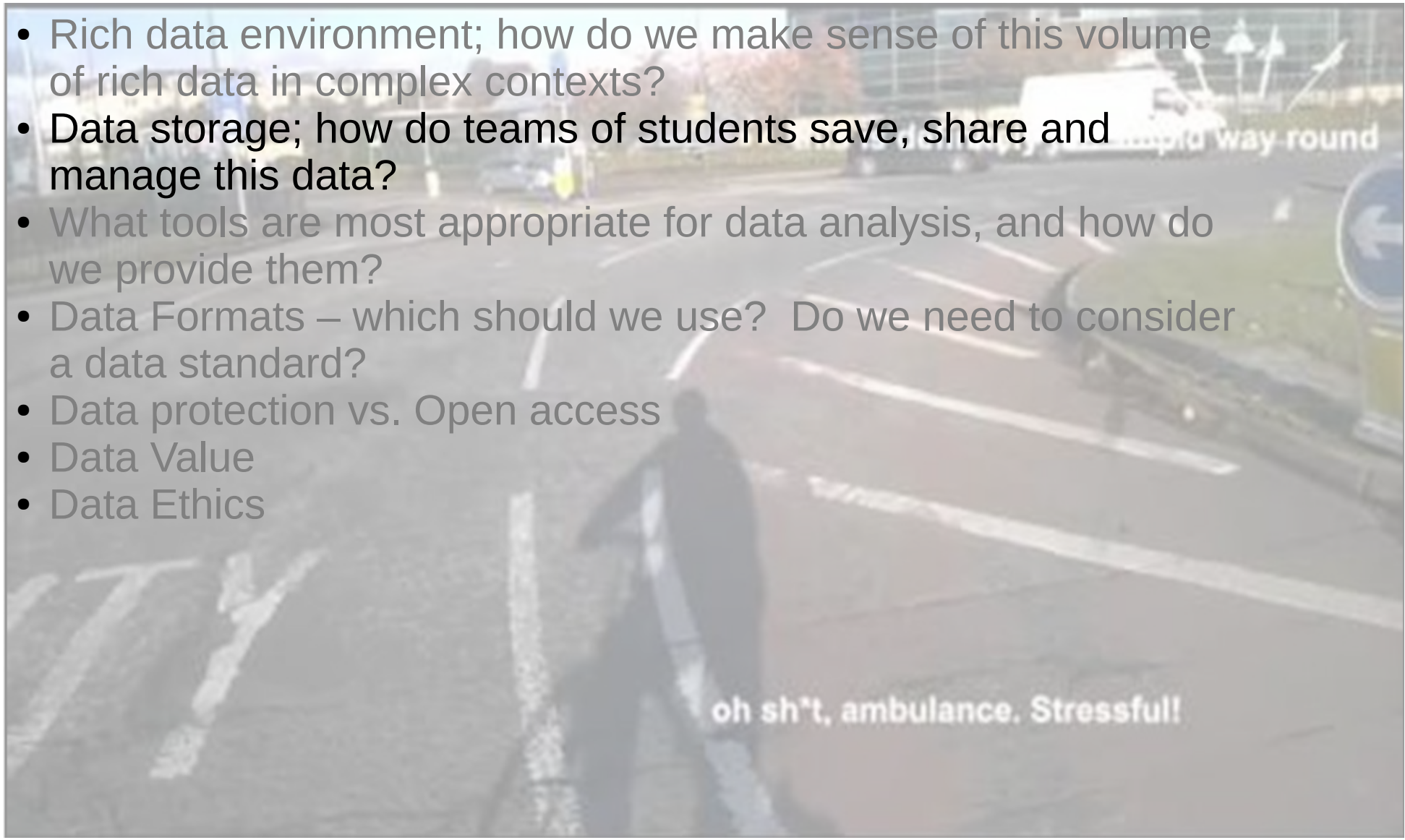


All student project – our notes



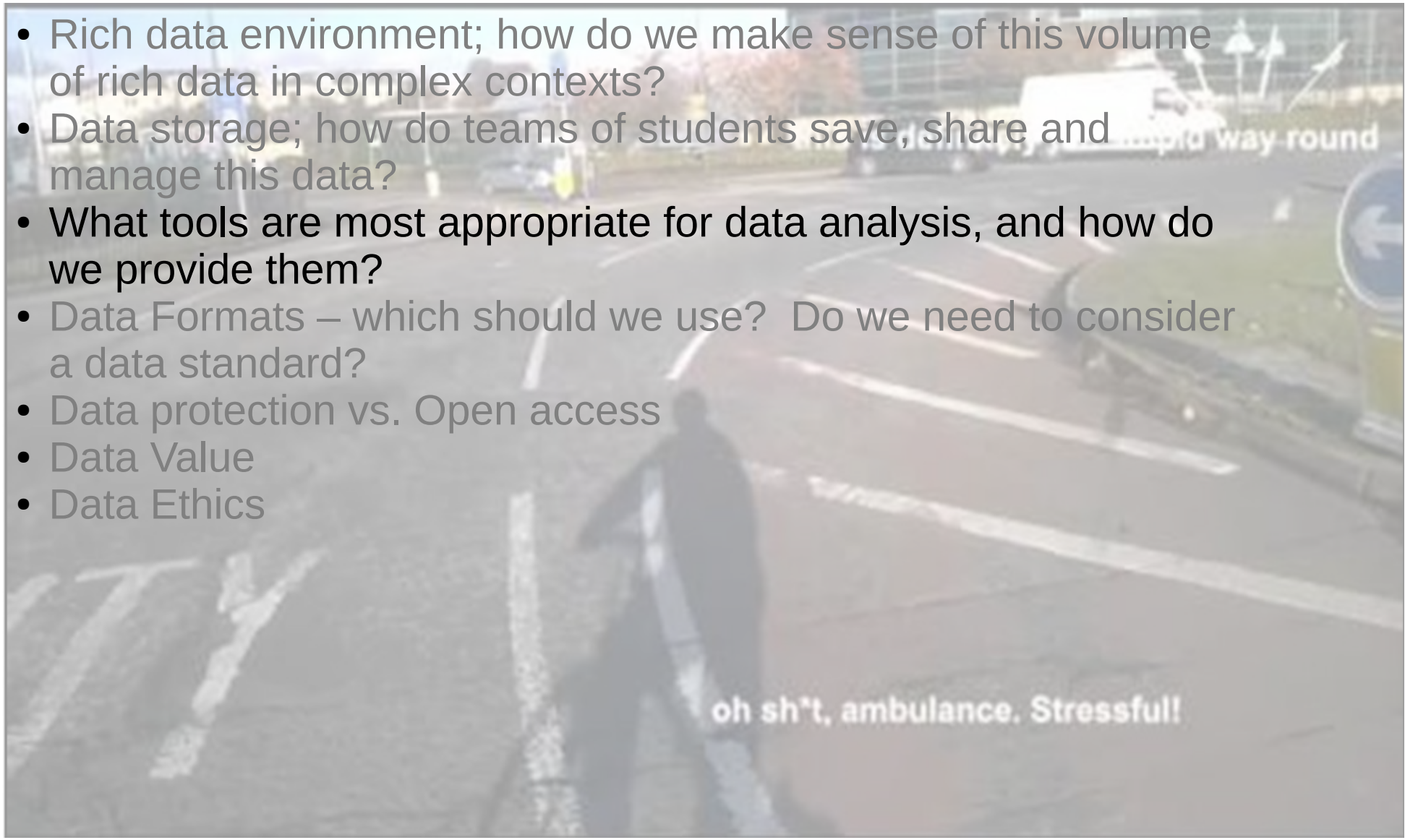
- Rich data environment; how do we make sense of this volume of rich data in complex contexts?
- Data storage; how do teams of students save, share and manage this data?
- What tools are most appropriate for data analysis, and how do we provide them?
- Data Formats – which should we use? Do we need to consider a data standard?
- Data protection vs. Open access
- Data Value
- Data Ethic

All student project – our notes



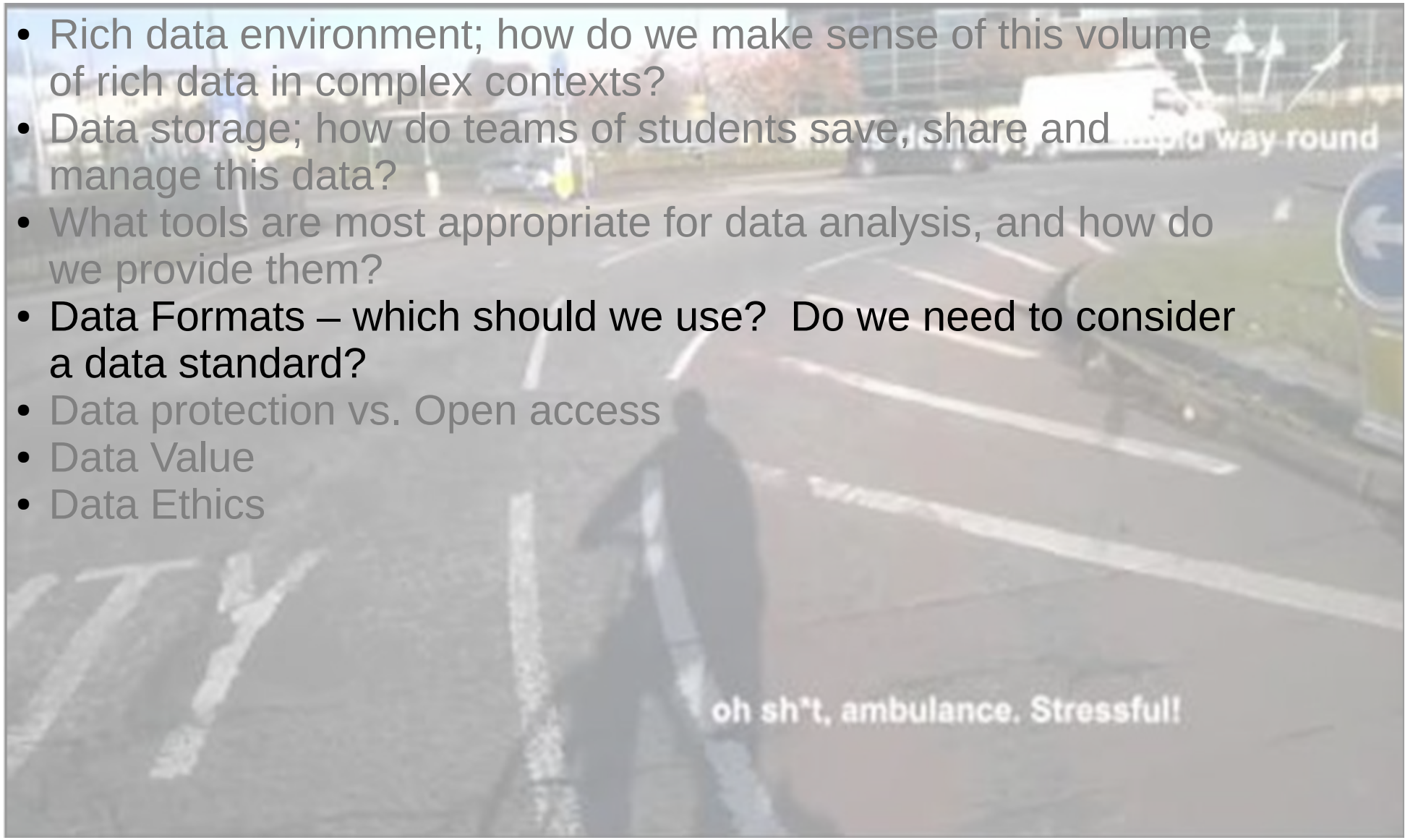
- Rich data environment; how do we make sense of this volume of rich data in complex contexts?
- Data storage; how do teams of students save, share and manage this data?
- What tools are most appropriate for data analysis, and how do we provide them?
- Data Formats – which should we use? Do we need to consider a data standard?
- Data protection vs. Open access
- Data Value
- Data Ethics

All student project – our notes



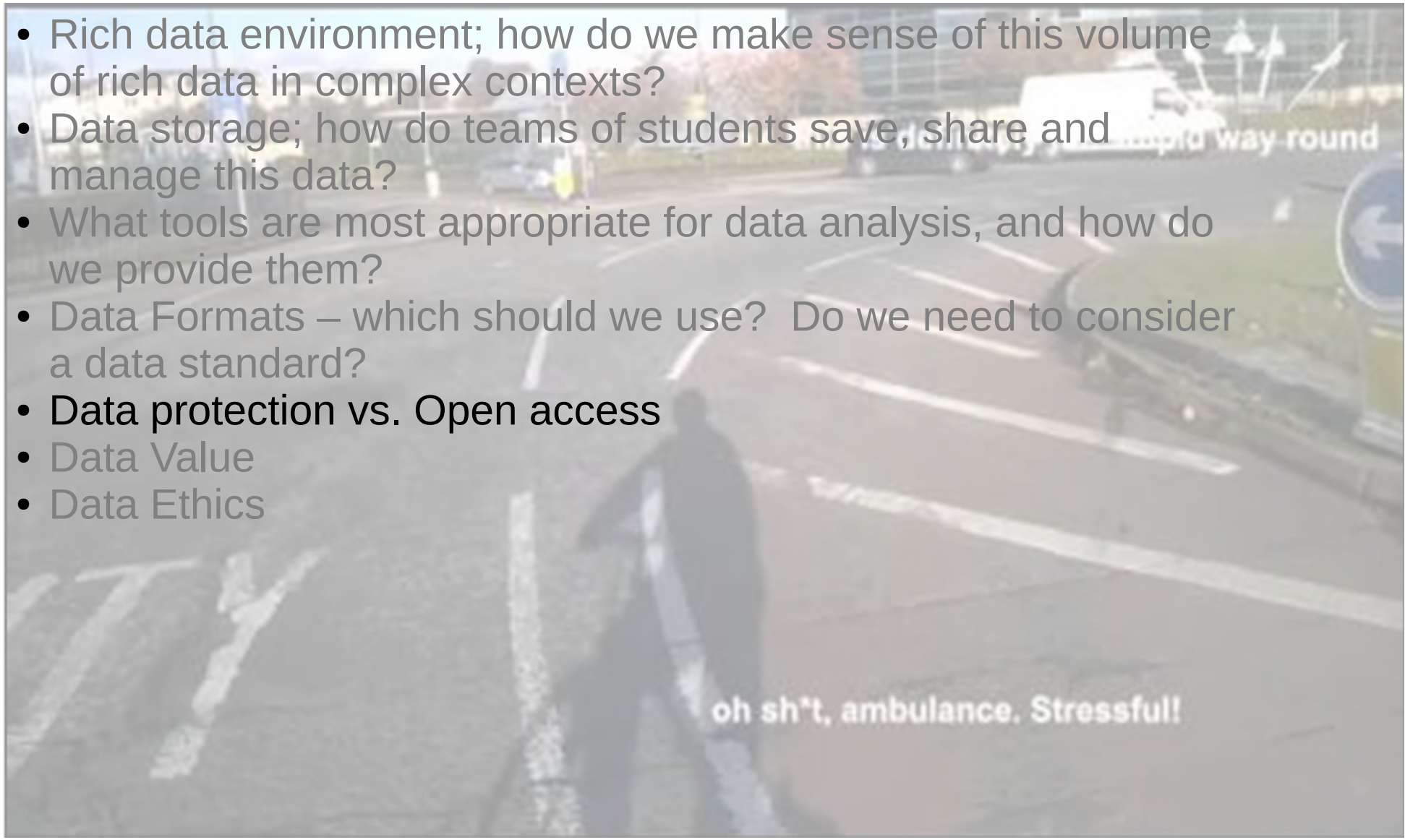
- Rich data environment; how do we make sense of this volume of rich data in complex contexts?
- Data storage; how do teams of students save, share and manage this data?
- What tools are most appropriate for data analysis, and how do we provide them?
- Data Formats – which should we use? Do we need to consider a data standard?
- Data protection vs. Open access
- Data Value
- Data Ethics

All student project – our notes



- Rich data environment; how do we make sense of this volume of rich data in complex contexts?
- Data storage; how do teams of students save, share and manage this data?
- What tools are most appropriate for data analysis, and how do we provide them?
- Data Formats – which should we use? Do we need to consider a data standard?
- Data protection vs. Open access
- Data Value
- Data Ethics

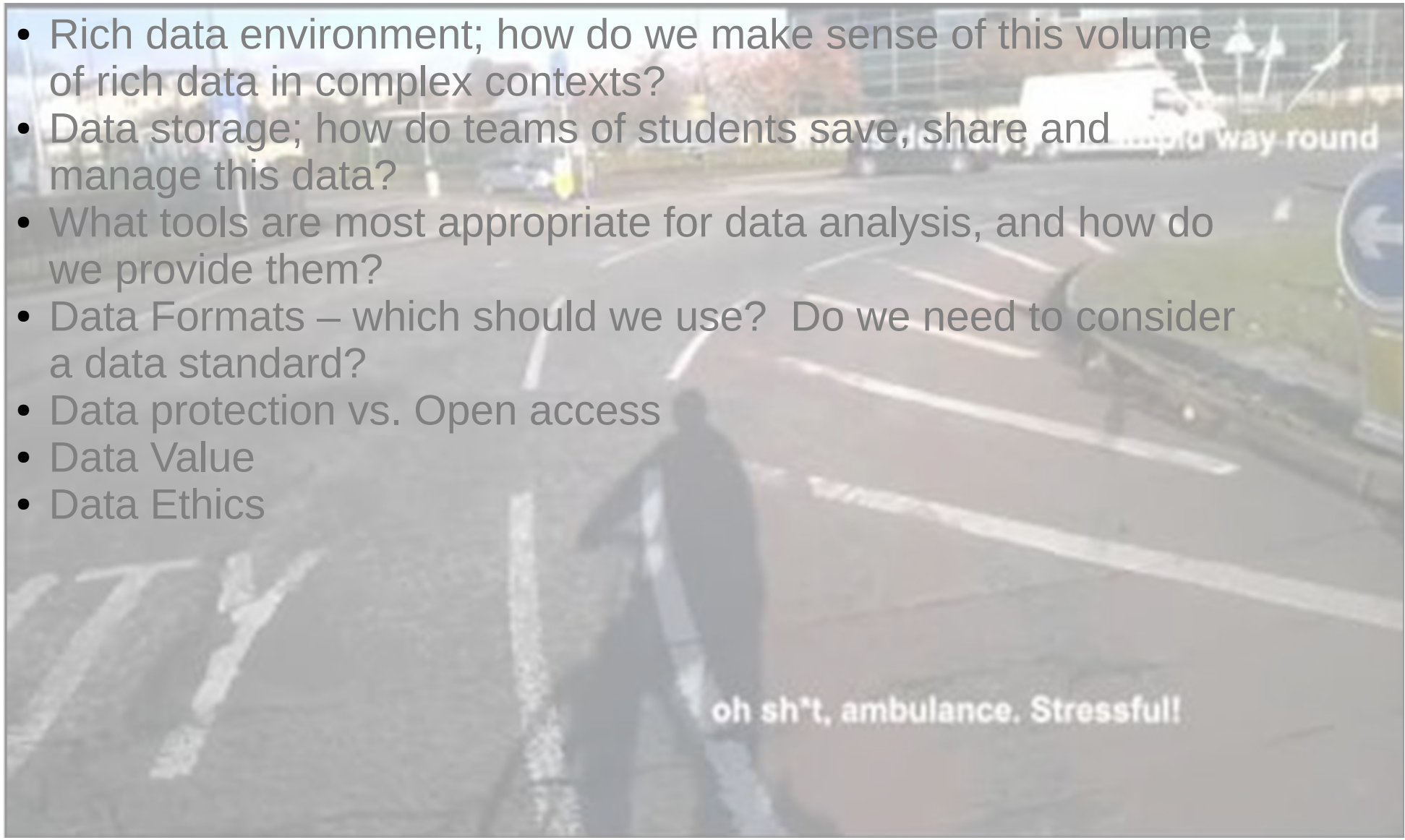
All student project – our notes



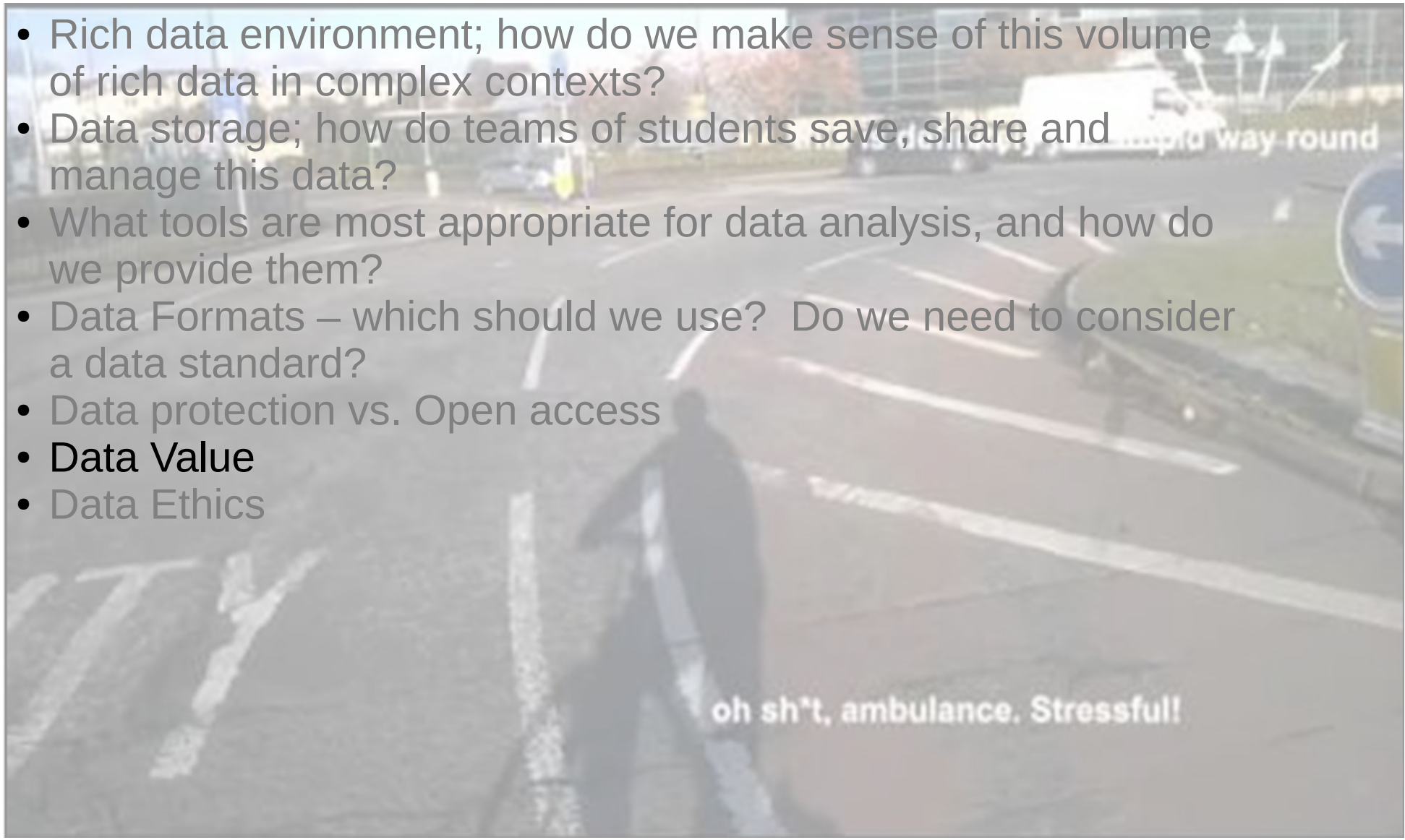
- Rich data environment; how do we make sense of this volume of rich data in complex contexts?
- Data storage; how do teams of students save, share and manage this data?
- What tools are most appropriate for data analysis, and how do we provide them?
- Data Formats – which should we use? Do we need to consider a data standard?
- Data protection vs. Open access
- Data Value
- Data Ethics

All student project – our notes

- Rich data environment; how do we make sense of this volume of rich data in complex contexts?
- Data storage; how do teams of students save, share and manage this data?
- What tools are most appropriate for data analysis, and how do we provide them?
- Data Formats – which should we use? Do we need to consider a data standard?
- Data protection vs. Open access
- Data Value
- Data Ethics

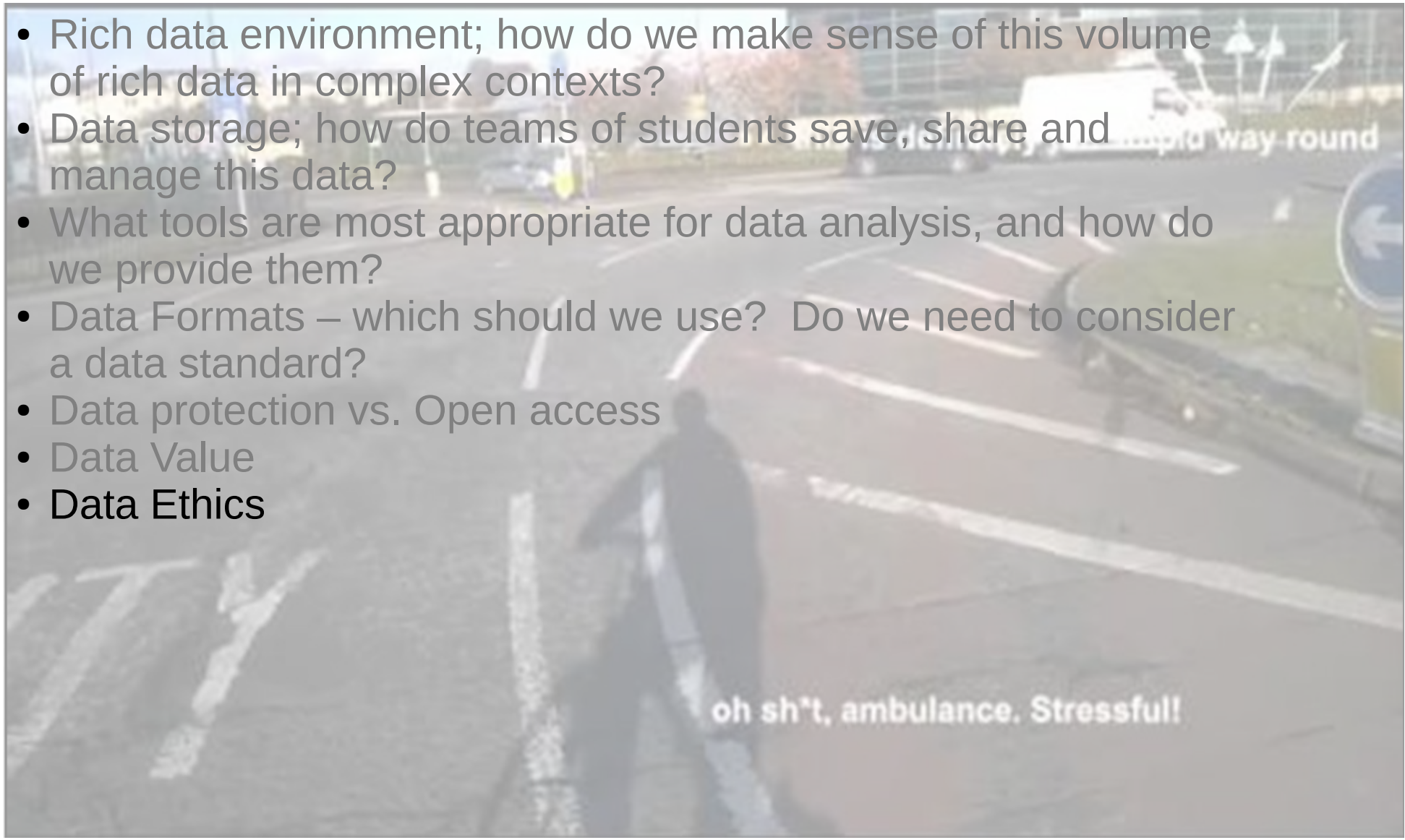


All student project – our notes



- Rich data environment; how do we make sense of this volume of rich data in complex contexts?
- Data storage; how do teams of students save, share and manage this data?
- What tools are most appropriate for data analysis, and how do we provide them?
- Data Formats – which should we use? Do we need to consider a data standard?
- Data protection vs. Open access
- Data Value
- Data Ethics

All student project – our notes



- Rich data environment; how do we make sense of this volume of rich data in complex contexts?
- Data storage; how do teams of students save, share and manage this data?
- What tools are most appropriate for data analysis, and how do we provide them?
- Data Formats – which should we use? Do we need to consider a data standard?
- Data protection vs. Open access
- Data Value
- Data Ethics

Data ecosystems and wicked problems: overview

Edinburgh Living Lab

- what is a Living Lab?
- how does it work?
- why is this work challenging? “Wicked” problems (Rittel & Webber, 1973)

Students as “researchers and practitioners”

- Design for Informatics (DESI11027); a postgraduate course with design students (MA) and informatics students (Msc)
- how do students manage “wicked” problems
- how to translate various types of data into persuasive information using design principles through a Living Lab environment

Case studies

- what do our students' projects reveal about challenges to working with data?
- tools for data transformation
- concerns about data storage and security
- issues of data ethics

Discussion – Thank you