



MSc. Research Practicum

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Overall Goal

As a team, design and develop a well-researched application that meets the project specification.

Key Learning Outcomes

On successful completion of this research practicum you will be able to:

1. Apply design thinking and problem-solving to real-world issues.
2. Evaluate suitable technologies and approaches to technical challenges.
3. Use programming skills, relational databases and web application development in a significant project.
4. Demonstrate professional skills (Communication, presentation, writing, team-work skills and time management).

3 things to concentrate on

1 | Working as a group

You will be assigned into teams.

Create a protocol for working together and resolving conflict

2 | Research & Development

Balance your time between investigating the domain, investigating the technology, and getting things working.

Group-based development can be slower than expected

3 | Reporting

Presentations count toward your final mark

Individual report, group report, and reflective essay all count towards your final mark

Timetable Outline

- + Groups and roles decided – 7th June (this Friday)
- + Faculty interactions will happen on Wednesdays
- + Team presentations: 12/6, 26/6, 10/7, 31/7, 21/8
- + Faculty meetings: 19/6, 3/7, 17/7, 24/7, 14/8

Team Presentations

- + 12 minute presentations (8 + 4 format)
- + Presentations must be uploaded to Brightspace the night before, all presenters will use a common laptop.
- + Different team-member presents each time
- + Order of teams will be posted on Brightspace

12 June	26 June	10 July	31 July	21 August
Initial Big Picture Ideas	Requirements & Architecture	Prototypes & Analytics	Current Working Prototype	Final Team Presentation

Faculty Meetings

- + Will do informal meetings but can book faculty time on Wednesdays in advance
- + All team-members **must** be in lab on Wednesday
- + Have a short summary of progress ready
- + Demonstrator support is also available during the summer
(Thursdays 2-4pm)

Elevator Pitch

- + Your team pitches your final product to industry reps
- + 3 - 5 minutes per team
- + Does not affect your grade
- + Likely 21st August, same day as final team presentations

Allocation of Marks

- + Presentations (15%)
 - + Group & individual each worth 7.5%
- + Project Report (60%)
 - + Shared group component (35%)
 - + Individual component (25%)
- + Reflection Essay (15%)
- + Teamwork skills and contribution (10%)

The Project: Dublin Bus Dynamic Travel-Time Estimation

Dublin bus provide static timetables & real time ETAs

How do I know how long
my trip will take?

How does this help me plan
a trip tomorrow?



Dublin bus timetables not realistic...



Dublin bus timetables not realistic...



Dublin bus timetables not realistic...



Consequences...

Dublin Bus's Expected Time for 46A ¹	61 minutes
Actual (measured) Time(s) for 46A	Min - 25 minutes Max - 90 minutes

¹ <https://www.dublinbus.ie/Your-Journey1/Timetables/All-Timetables/46a-2/>

Your job – Make Dublin Bus travel predictable

- + Use open-data including
 - + Historical GPS data from DublinBus
 - + Current & forecast weather
 - + Historical Weather
- + Create predictive models for travel time
- + Create an app (web-based) that predicts journey times
 - + For a given origin-destination
 - + At a given time of day
 - + Taking weather conditions into account

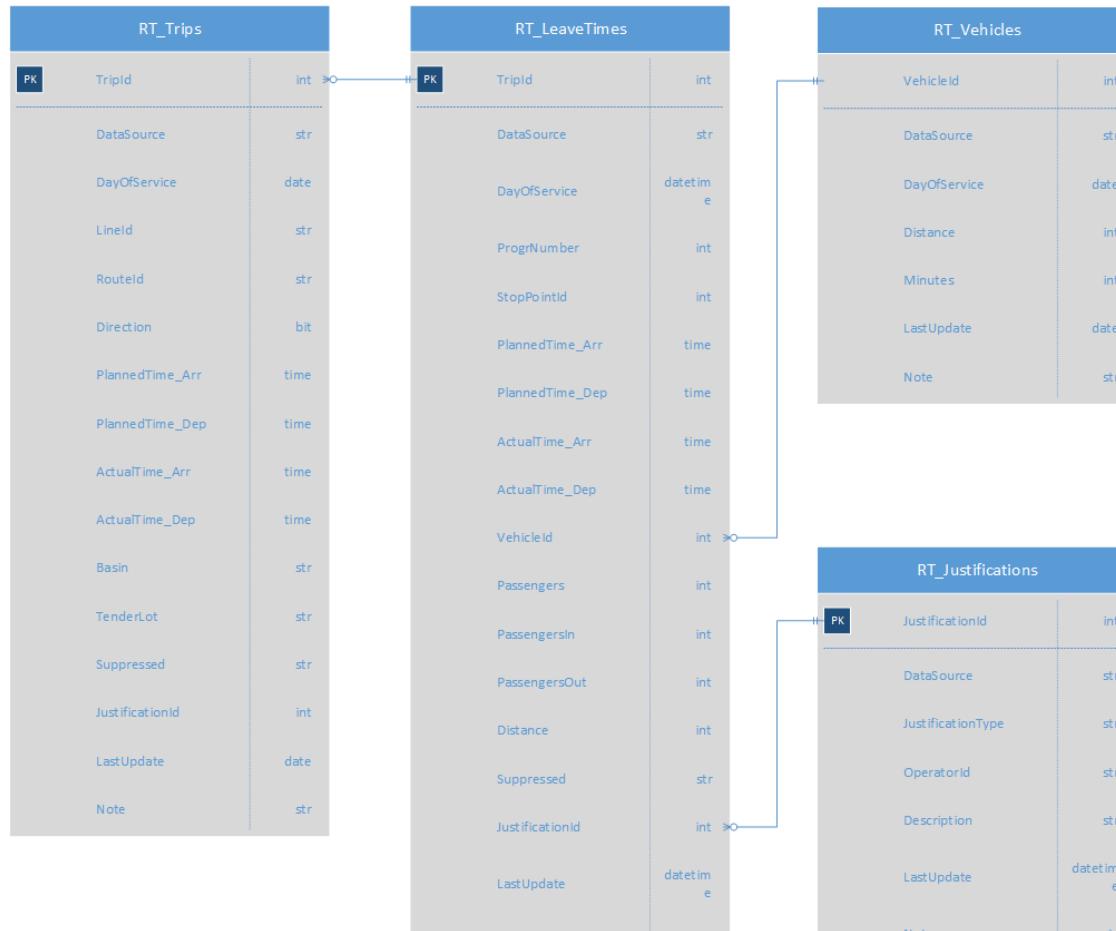
Historical Dublin Bus Data

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Historical Dublin Bus Data

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Historical Dublin Bus Data



Historical Weather Data

Date/Time	Temp (°C)	Precip (mm)	Wind Dir	Wind Speed (m/s)	Humidity (%)	Pressure (hPa)	Cloud Cover (0-100)	Rainfall (mm)	Snow Depth (cm)	UV Index	Wind Chill (°C)	Heat Index (°C)	Wind Gust (m/s)	
01/01/2012 05:00	0	0.1	0	8.2	0	7.1	5.8	9.2	85	998.9	2	15	2	230
01/01/2012 06:00	0	0.1	0	8.1	0	7.2	6.1	9.4	87	998.2	2	12	2	230
01/01/2012 07:00	0	0.1	0	7.2	0	6.5	5.7	9.1	90	998	2	10	2	270
01/01/2012 08:00	2	0	0	7.6	0	6.6	5.3	8.9	86	997.7	2	10	2	230
01/01/2012 09:00	2	0	0	7.4	0	6.1	4.5	8.4	81	997.5	2	11	2	230
01/01/2012 10:00	0	0	0	7.3	0	6	4.3	8.3	81	997.1	2	13	2	220
01/01/2012 11:00	0	0	0	7.6	0	6.1	4.1	8.2	79	997.1	2	15	2	230
01/01/2012 12:00	0	0	0	7.9	0	6.3	4.1	8.3	78	996.1	2	19	2	230
01/01/2012 13:00	0	0	0	7.9	0	6.2	3.9	8.1	76	995.6	2	20	2	230
01/01/2012 14:00	0	0	0	8	0	6	3.3	7.7	72	995.3	2	20	2	240
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01/01/2012 18:00	2	0	0	4.8	0	3.8	2.4	7.2	84	997.6	2	13	2	240
01/01/2012 19:00	0	0.1	0	3.2	0	2.5	1.3	6.8	88	997.5	2	17	2	240
01/01/2012 20:00	0	0	0	3.2	0	2.5	1.3	6.8	88	998.3	2	11	2	230
01/01/2012 21:00	0	0	0	3	0	2.3	1.2	6.6	88	998.7	2	8	2	200
01/01/2012 22:00	0	0	0	3	0	2.2	0.9	6.5	86	998.3	2	11	2	210
01/01/2012 23:00	0	0	0	2.9	0	1.9	0.2	6.2	83	998.1	2	14	2	220
02/01/2012 00:00	0	0	0	3.1	0	1.9	0	6	79	998.5	2	16	2	220
02/01/2012 01:00	0	0.6	0	2.5	0	1.9	0.9	6.5	89	999	2	15	2	220
02/01/2012 02:00	0	0.9	0	1.8	0	1.5	1.1	6.6	94	998.9	2	14	2	240
02/01/2012 03:00	0	0	0	1.8	0	1.2	0.1	6.2	89	999	2	15	2	230
02/01/2012 04:00	0	0.1	0	1.9	0	1.4	0.6	6.4	91	999.1	2	16	2	230
02/01/2012 05:00	0	0.2	0	1.6	0	1.2	0.6	6.3	93	999.4	2	18	2	230

Additional sources of OpenData

- SmartDublin
 - DublinBus GTFS Feed (General Transit Feed Specification)
 - Traffic Journey times
 - Dublin Traffic
- OpenWeather API / DarkSky / AccuWeather
- Any other you can get hold of...

Expectations of teams

- Good software engineering practices
- Good teamwork approaches
- Good research practices
- **Innovation beyond the project specification**

Innovation – make it your own

- Innovative use cases
 - e.g. bus maps for tourists
- Innovative features
 - e.g. integration with other transport systems
- Technical innovations
 - e.g. implement a route planning algorithm

Technical Challenges

- Data parsing & transformation
 - Different sources will have different formats, nomenclatures, granularity
- Analytics
 - Choosing the right model
 - Testing your predictions
- Design and usability
 - Making software that's easy to use and intuitive
- Integration diverse technologies

Career Development

- Talks from Edel Caraway (UCD Career Development)
- Diverse topics
 - Exploring Career Options
 - Effective Applications
 - Technical Whiteboard Interviews
- Preliminary dates: 5 June (tomorrow!), 19 June, 24 July, 14 August

Questions

