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Edinburgh Futures Institute
Traveltech
Innovation Hub
RESEARCH
The Plumbing Matters
The Hidden Tech Infrastructure of Tourism

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Edinburgh Futures Institute | **Traveltech Innovation Hub**

UK's Centre for Traveltech Innovation

Work with over 200 Traveltech businesses...

Challenge. Create. Change.

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Travel
(and Traveltech)

Tourism

Festivals

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Traveltech Ecosystem

Multiple systems sometimes working together, often looking against each other...

Pujadas, R., Valderrama, E., & Venters, W. 2024. The value and structuring role of web APIs in digital innovation ecosystems: The case of the online travel ecosystem. Research Policy, 53(2): 104931.

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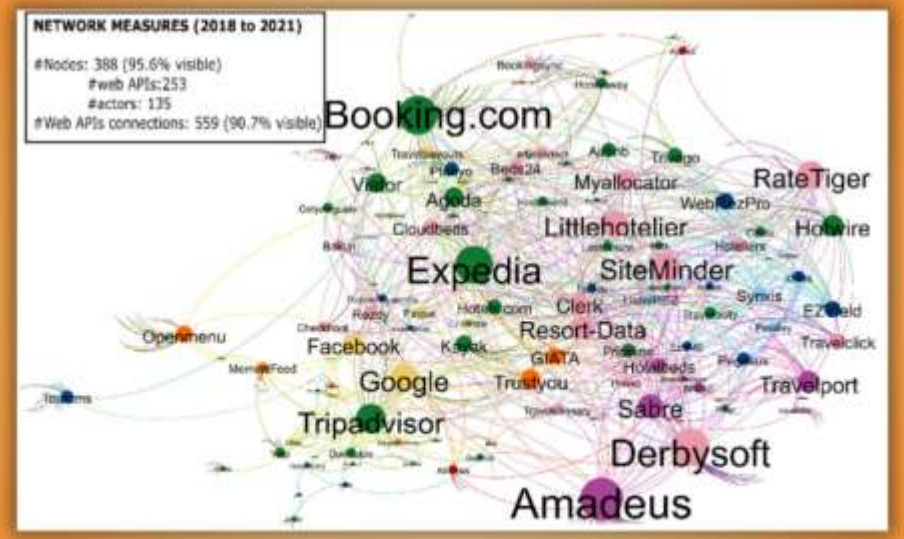

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The API Ecosystem

26 years. 264 web APIs. 135 actors. One incredibly complex ecosystem of value exchange

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Invisible Ecosystem

This infrastructure is not visible to travellers, operators, or policymakers. But it determines who captures value from every transaction.

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Traveltech Evolution...

Booking.com

Disintermediation

OTAs bypass travel agents. Bookings still confirmed by phone, fax, email.

DerbySoft

Reintermediation

First travel web APIs. Channel managers and metasearchers enter by building their own interfaces.

Google

Maturity

APIs go public. Easy to imitate, cheap to switch. Google enters by copying existing APIs. OTA commissions rise from 4% to 30%.

amadeus

Monstisation

APIs become products. Amadeus runs 1,000+ paid API services. Marketplaces emerge where startups buy, combine, and resell.

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Real-time algorithmic auctions

Google, Kayak, and TripAdvisor introduced auctions for hotel placement. Hotels and OTAs bid against each other in real time for visibility

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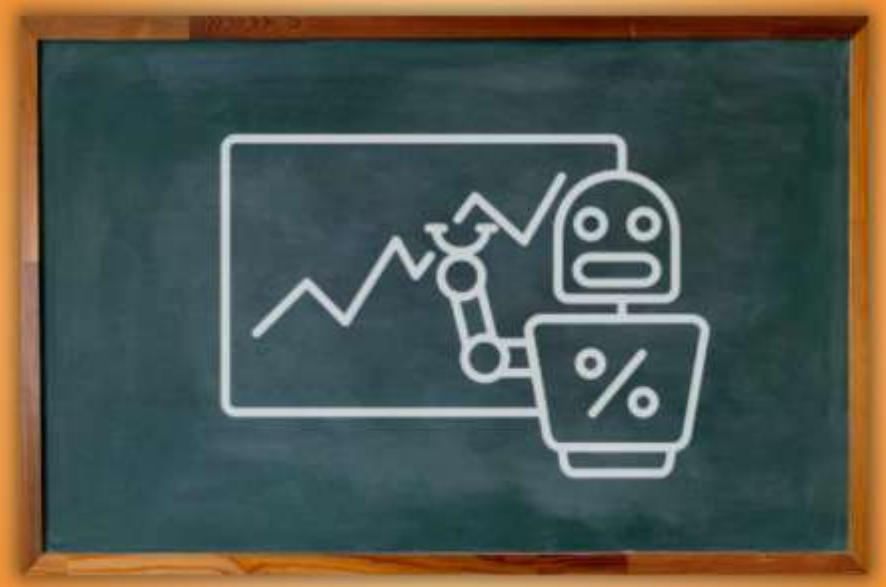

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The Intelligence Layer

Revenue Management Systems started analysing the API traffic itself. The pattern of calls became more valuable than what the calls carried.

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MEWS

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API Marketplaces

Apaleo and Mews - where third parties could build, sell, and buy API-based services.

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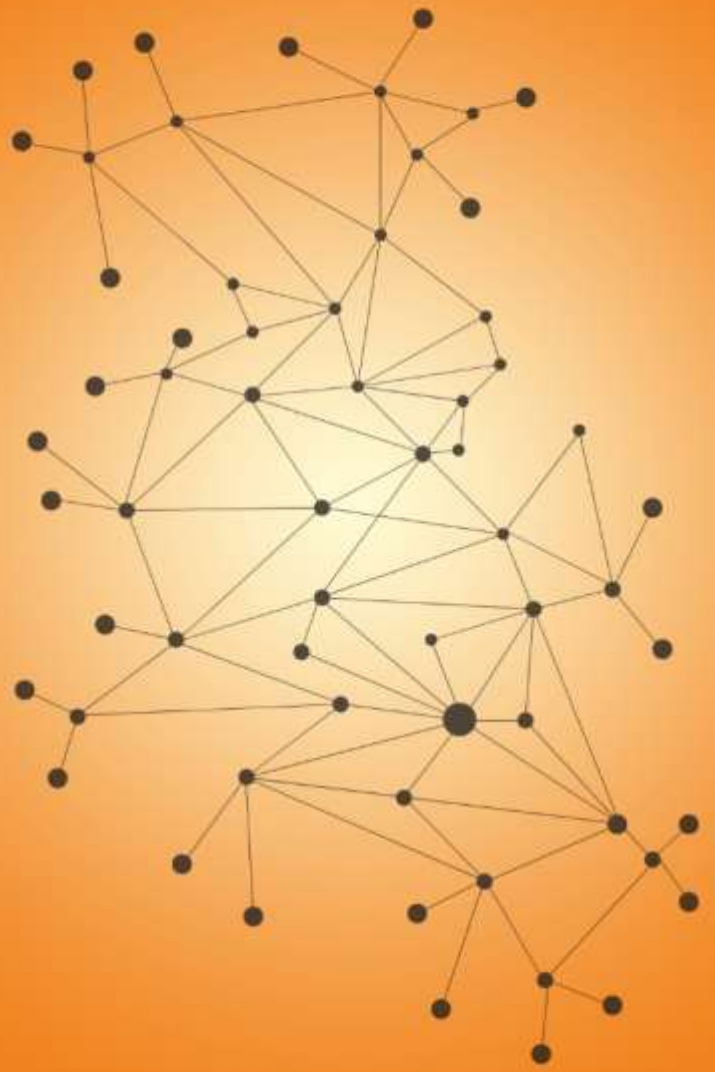

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Capturing Value in Connections

Commissions, fees, advertising revenue. The operators who provide the product pay for the privilege of being visible through someone else's infrastructure.

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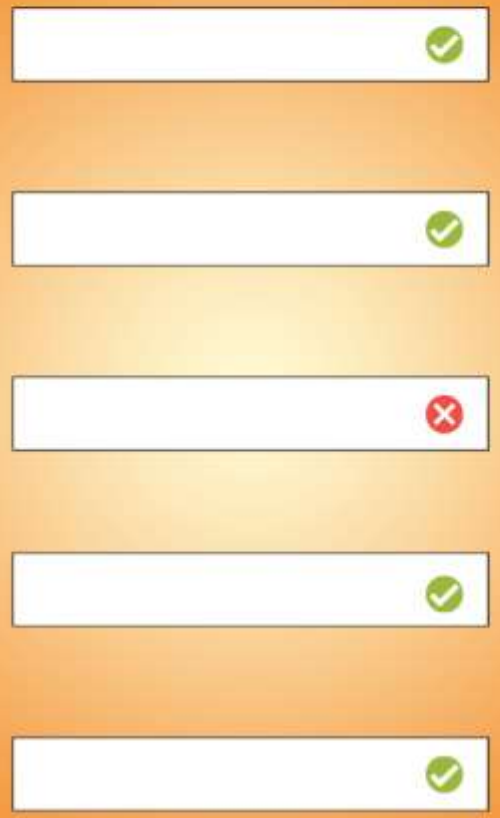

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The Interface sets the Terms

Whoever designs the interface decides what counts. If there is no field for it, it does not exist.

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SO WHAT?

Transactional infrastructure determines who captures economic value

It is often invisible to operators and policymakers, yet has material consequences for tourism destinations.

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An Overview of Knowledge Graphs

What are they?
What are they used for?
What are their components?
Why should we care?

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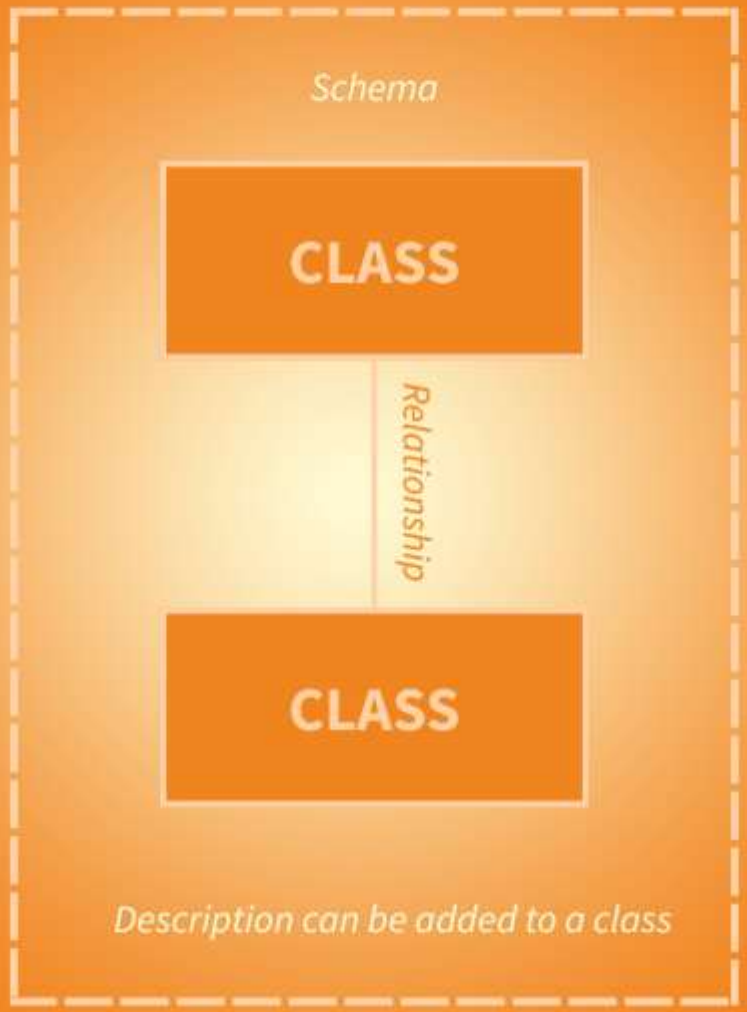
Knowledge Graph Components?

The entities, nodes, or **classes** represent main concepts or items.

Relationships, edges, or **connections** build relationships.

An ontology or **schema** maintains uniformity.

Properties, attributes, or **descriptions** provide more context and info to components.

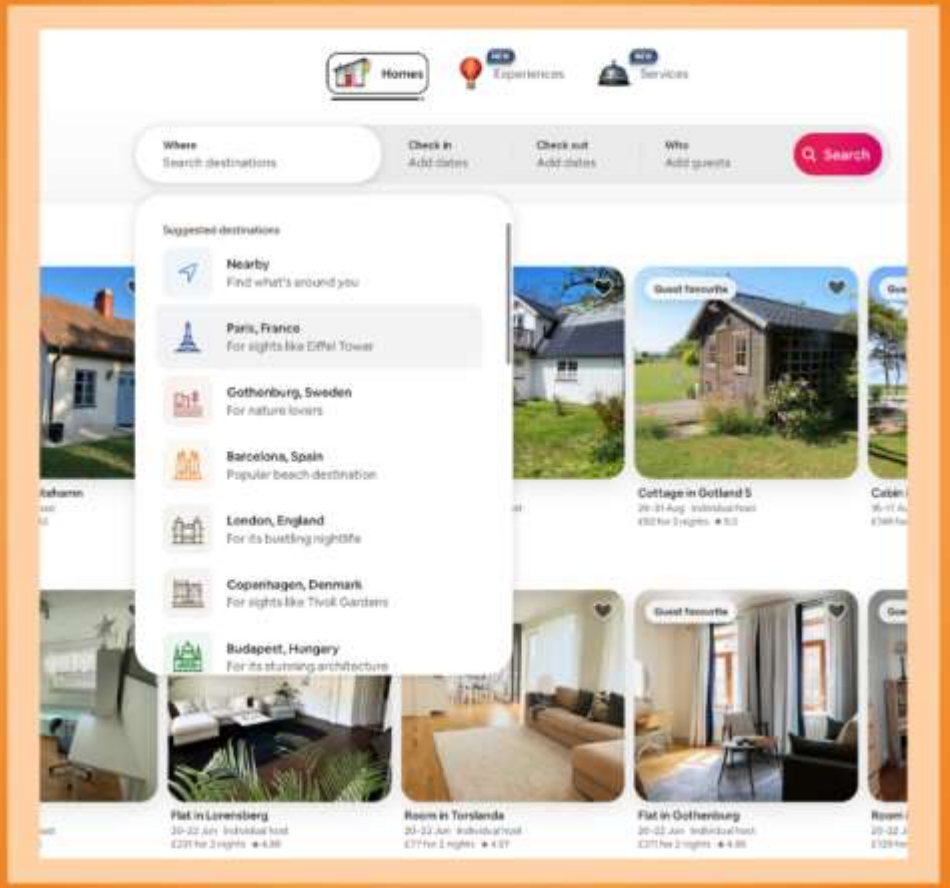


Example: Airbnb

Airbnb uses its KG to link a variety of home and experience descriptions, place-based concepts, and user behaviour to enhance **search results**, personalise **recommendations**, and aid in **marketing** efforts.

This device works to generate a specific, Airbnb branded knowledge of place as it surfaces “the right” content to users.

This also inherently makes ignorance of place, as it obscures content that works against Airbnb’s brand values.



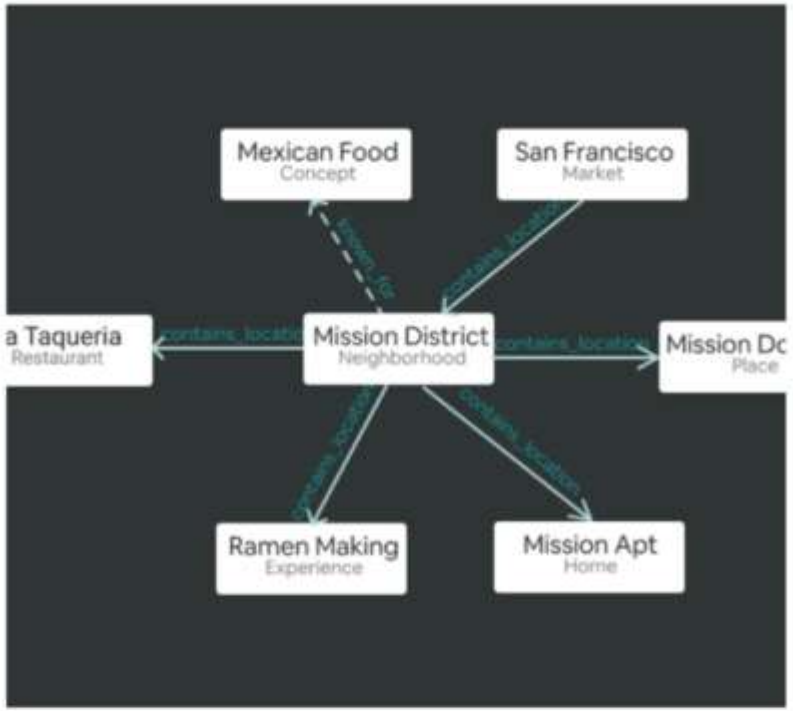
The World According to Airbnb

Entities + Relationships = New Knowledge

Technical Structure: Nodes and Edges
Nodes: Entities (restaurants, neighborhoods, experiences)
Edges: Relationships between entities ("located in", "tagged by")

These associations connect an entity like a home, to an entity like a neighborhood, to an entity like surfing. Associations ascribe meaning by defining a value or condition with each connection.

For example, this neighborhood entity is “known_for” the entity of Mexican Food, and this home entity is “in” this neighborhood entity of Mission District. Therefore, the home is good for Mexican food.



“Visualization of the hierarchy for location relationships” (Chang, 2018)

Associations add value-driven meaning to entities in the KG

"The point of the graph is like you're traversing these connections [you] go from, you know, a city to, like a neighborhood or to, you know, the experiences of a neighborhood […] out to like the categories and stuff. [It allows us to answer] what activities are good in this destination?"

William, Airbnb knowledge graph engineer, 2021 interview

"I tweak my listing… When we got this amazing new sandwich shop at the bottom of the street, I had to add that."

Alison, Edinburgh Airbnb Homes Host, 2020 interview

Feature: Guidebooks

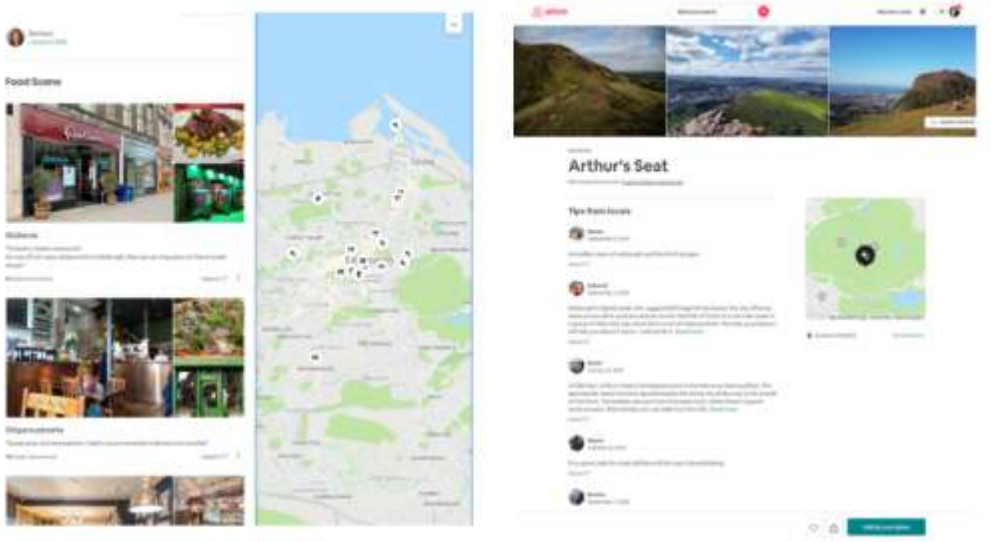
From Individual tips to collective knowledge

How Guidebooks Work

- Hosts curate local recommendations for their listings
- Recommendations become "entities" in the knowledge graph
- Multiple hosts recommending the same place creates "place pages"
- Associations generate categories like "food scene"

The Collaborative Process

Individual "tips from locals" → Associated by name, classification, location → Collective "place pages" → Algorithmic recommendations → Personalized content



My screenshots of a guidebook and place page constructed of relationships between categories, local tips, and location.

Feature: Guidebooks

From Individual tips to collective knowledge

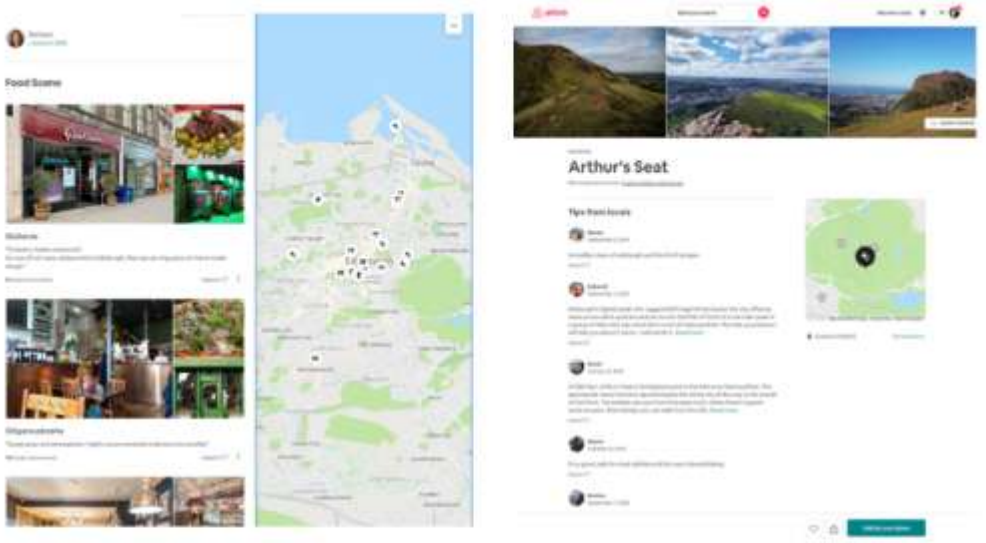
What This Reveals

Co-creation: Hundreds of hosts build collective knowledge

Economisation: Non-bookable places enhance bookable listings

Visibility: Available during trip planning, not just after arrival

Integration: Connected to Google Maps, Foursquare, etc.



My screenshots of a guidebook and place page constructed of relationships between categories, local tips, and location.

SO WHAT?

Representational infrastructure determines how places are seen

It is often invisible to operators and policymakers, yet has material consequences for tourism destinations.

Research Questions?

Tech Infrastructure

What happens when AI capability becomes the primary source of competitive advantage?

Representation

How do knowledge graphs and AI training data shape the representation of destinations, and whose interests do they serve?

Value in Agentic Markets

Where does value accrue - to the operator, the platform, the agent, or the data infrastructure provider?

Outcomes

How do we measure and ensure equitable societal outcomes from tourism's digital infrastructure?

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Joshua Ryan-Saha

joshua.ryan-saha@ei.ed.ac.uk
www.efi.ac.uk