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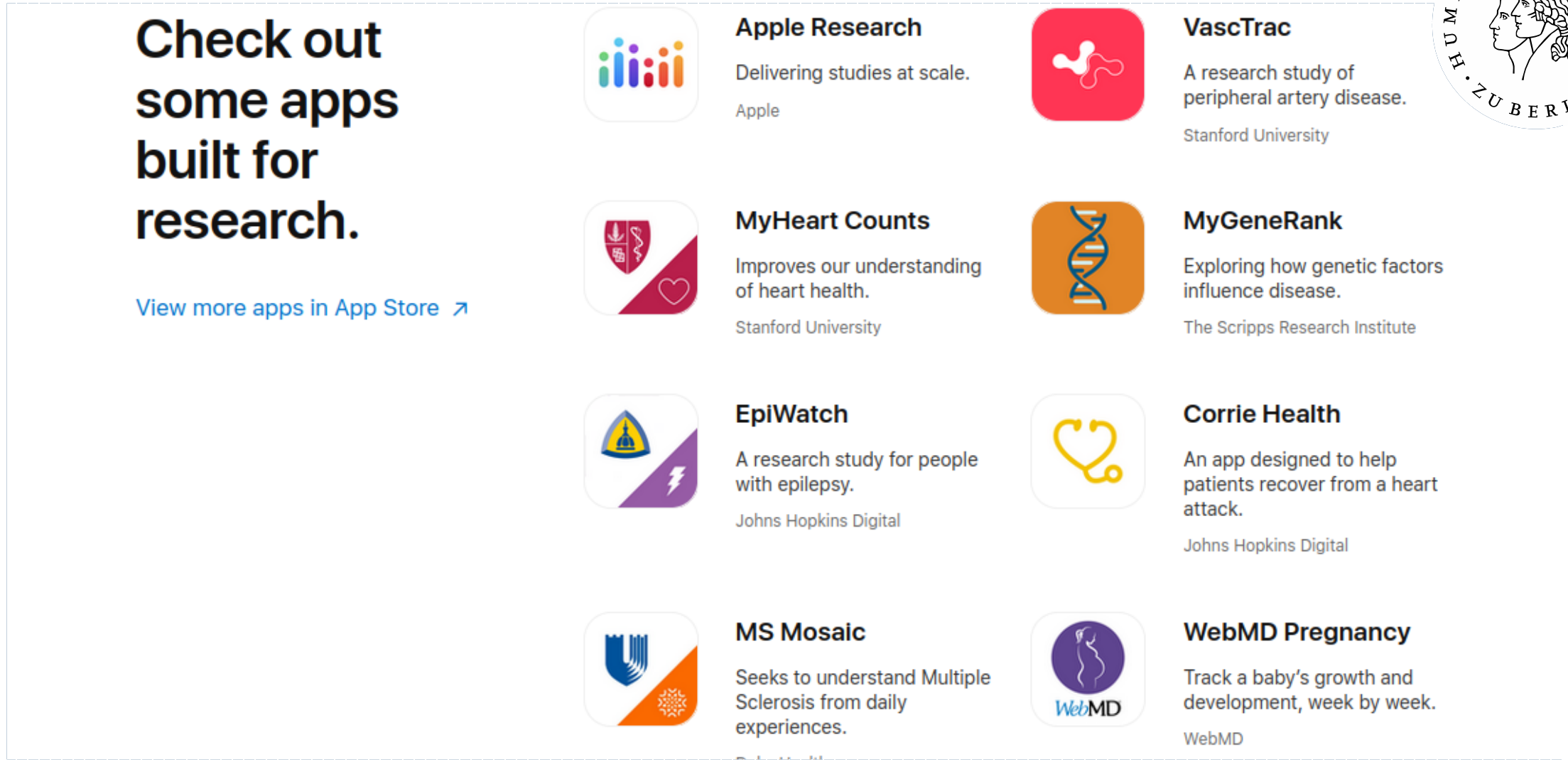
An Analysis of Requirements and Privacy Threats in Mobile Data Donations

Intro



Apple Researchkit Apps

Focus of this Talk

- Analysis of risks when **crowdsourcing** of health data
  - Focus on research context
  - Is privacy ensured? What type of data is at risk?
- Outline
  - What data do apps collect?
  - Model data collection process
  - Analyse risks

1

Analysis of Existing Apps

Provided Functionalities

- Pubmed Search:
  - Clinical trials for mobile health
  - Using smartphones and apps
- Top 100 entries retrieved
- 74 papers accessible and relevant
- Provided functionalities were sorted into categories
  - Multiple categories possible

Provided Functionalities

- Informing and educating 45
- Reminders and notifications 37

- **Communication** with professionals 19
- **Communication** between donors 6

- Self-tracking 24
- Questionnaires 23
- App interaction 24
- Feedback 29

- External sensors 10
- Wearables 9
- Internal sensors 2
- Digital health/tracking 4

2

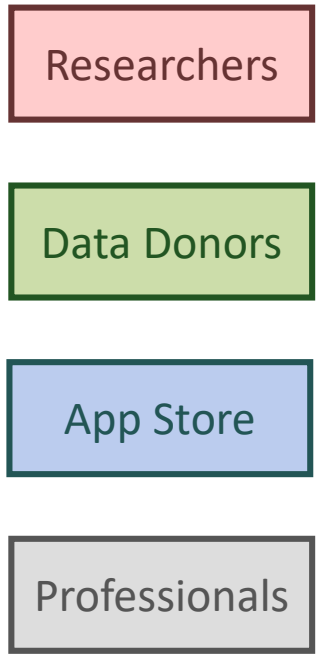
Privacy Threat Modeling

Linddun Framework

- Linkability (L)
- Identifiability (I)
- Non-repudiation (N)
- Detectability (D)
- Disclosure of information (D)
- Unawareness (U)
- Non-compliance (N)

Modeling Steps

- Create data flow diagram
  - Actors
  - Data stores
  - Processes
  - Data flows
- Identify risks with threat catalog



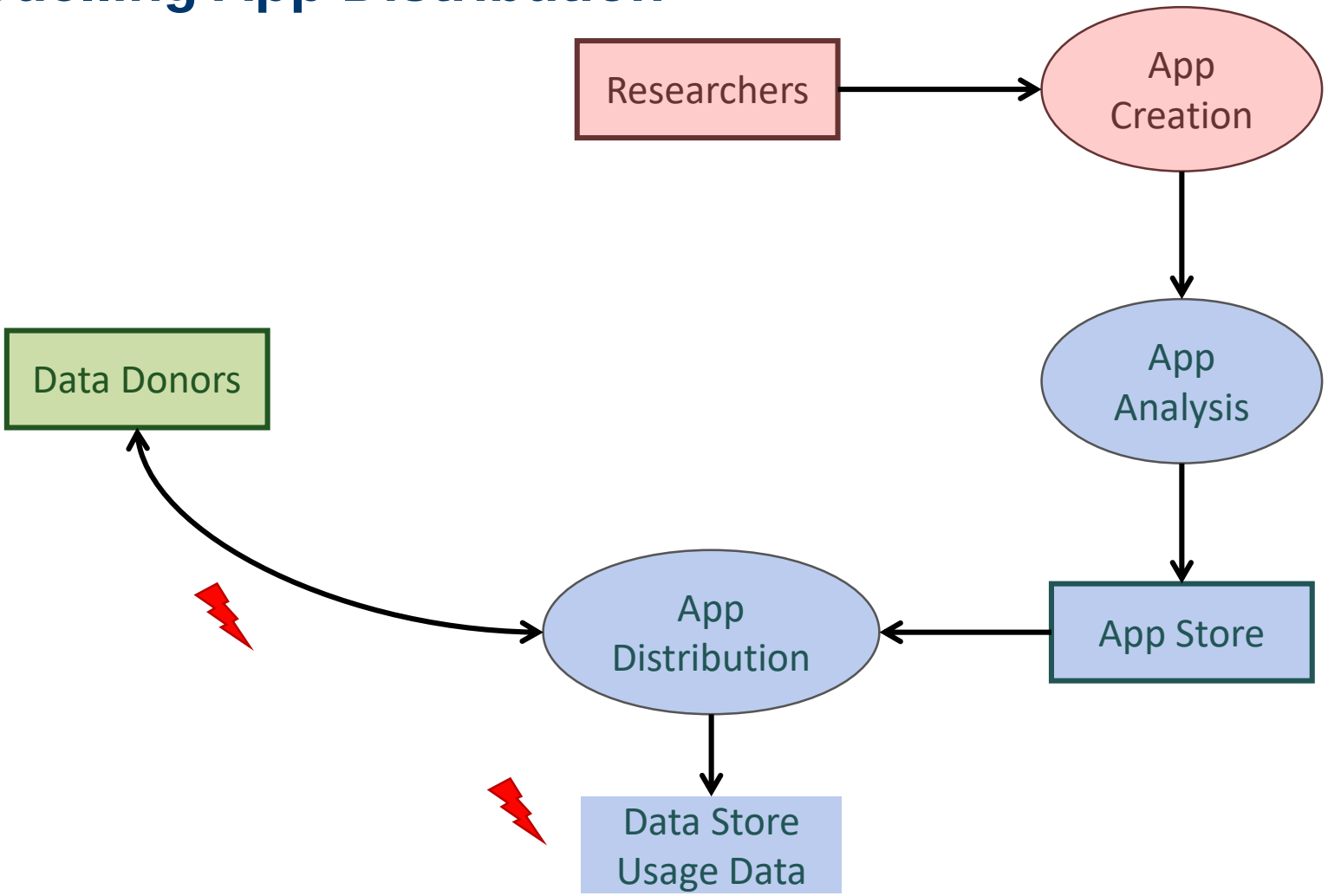
Modelling App Distribution

Data Donors

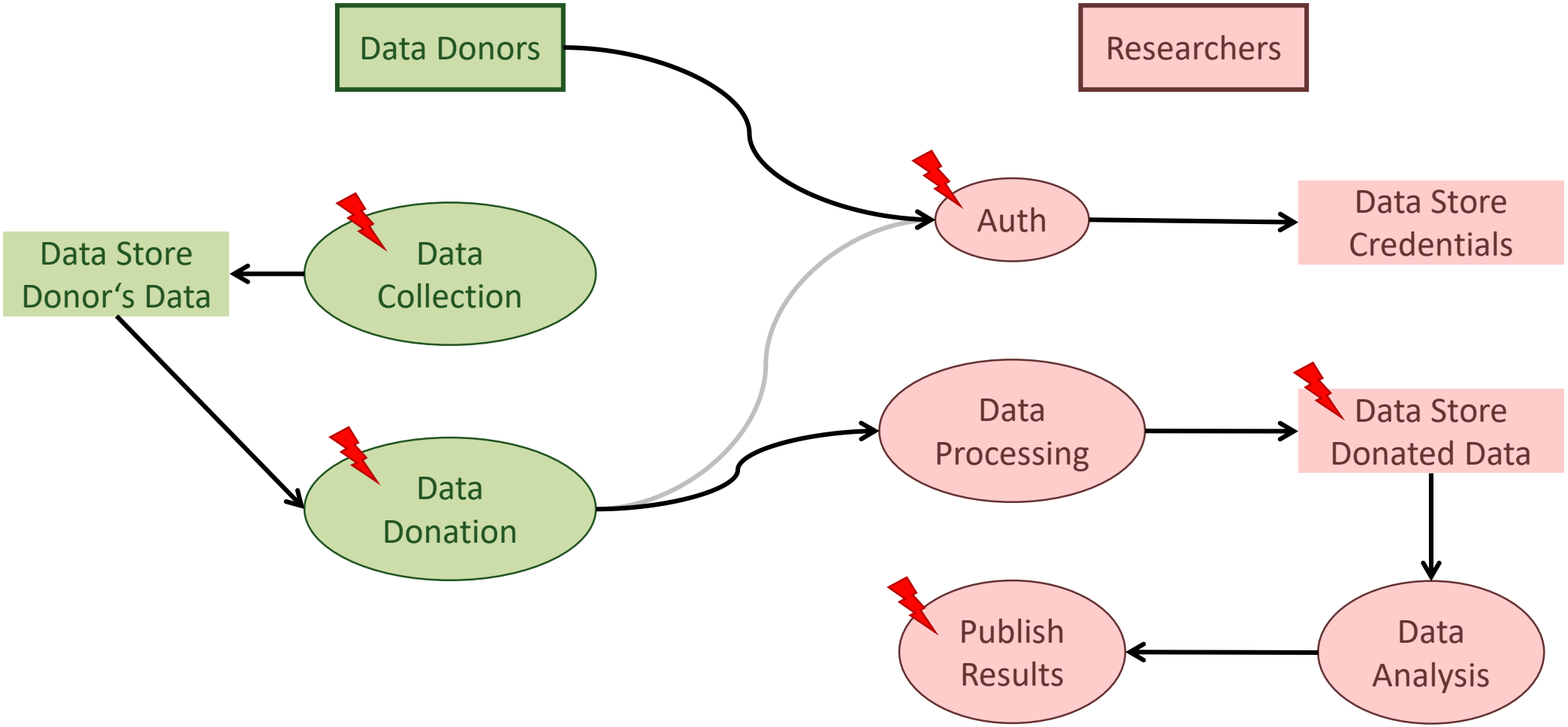
Researchers

App Store

Modelling App Distribution



Modelling Data Collection



More Notable Attack Vectors

- Leak of communication data
  - Even if encrypted and self-hosted
  - Metadata, communication patterns, message types…
- Threats to Functionality:
  - Fake researchers
  - Manipulation of studies
- …

Conclusion

- Many apps exist for crowdsourcing medical data
- Used **infrastructures leak various types of data**
- Solutions to some threats in the paper
- Suitable privacy preserving platforms for **wide-spread** use needed

Questions?

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References

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Modelling Communication

- Communication types
  - Donors to professionals
  - Between donors: Directly or in groups
- Communication infrastructure
  - Self-hosted or external third party
  - Data is encrypted but meta-data leaks

Communication Donor to Donor