Characterizing Inter-contact Patterns in Delay Tolerant Networks

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Context

The scenario

- **Mobile users** carrying always-on devices
- **Direct communication** opportunities between people
- Interactions are driven by **social factors**

Main challenge

- **Understanding contact patterns in DTNs** is elemental to the design of effective routing or content distribution schemes.
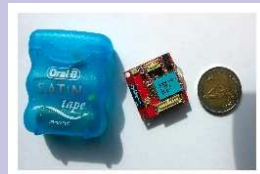
Mobile users intermittently connected

Data sets

MIT (Reality Mining experiment)

- **97 phones** over an academic year (2004-2005)
- Proximity recorded using **Bluetooth** (every 5 minutes)
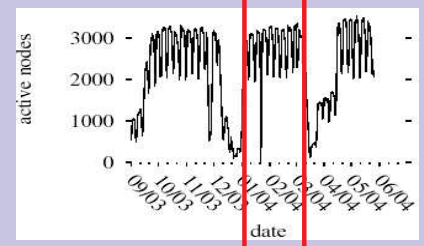- **90 first days** of data

iMote

- **41 iMotes** over **3 years** at Infocom 2005
- **Bluetooth** contact loggers that people carry in their pockets
- Log proximity (10 meters) every 2 minutes

Dartmouth

- **Not** a true DTN data set
- One of the largest **Wi-Fi** data collection efforts
- **550 APs**

Methodology

- Looking at **pairwise contact** and **inter-contact times**
- **Cramer-Smirnov-Von-Mises** statistical hypothesis test that rejects the hypothesis with **99%** of confidence
- Visual cross-checking
- **Hypothetic distributions** (Exponential, Pareto, Log-normal)

contact time   inter-contact time
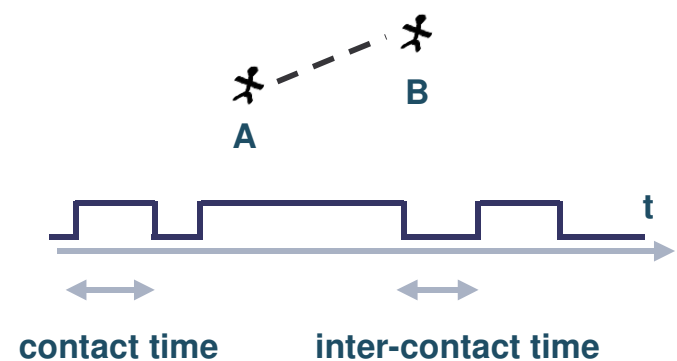
Results

Heterogeneity of pairwise processes

mean inter-contact times (CCDF)   mean contact times (CCDF)
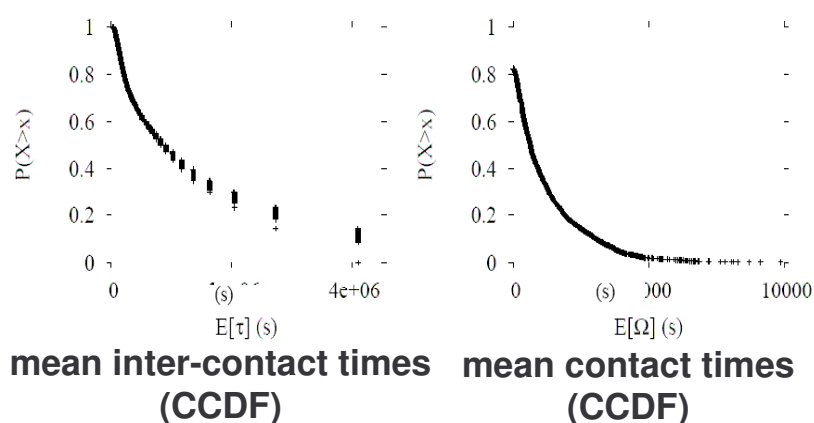
Fitting results

	Dartmouth	MIT	iMote
Nb. Pairs	20,211	2,174	755
Exponential	42.8 %	56.3 %	7.9 %
Pareto	34.2 %	26.5 %	12.3 %
Log-normal	85.8 %	96.9 %	99.4 %

- DTN models **should not** consider node pairs homogeneously
- **Inter-contact times better characterize** interactions than contact times

- Pairwise processes **can not be considered in power-law**
- We conjecture that most of the **inter-contact processes are in log-normal**

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