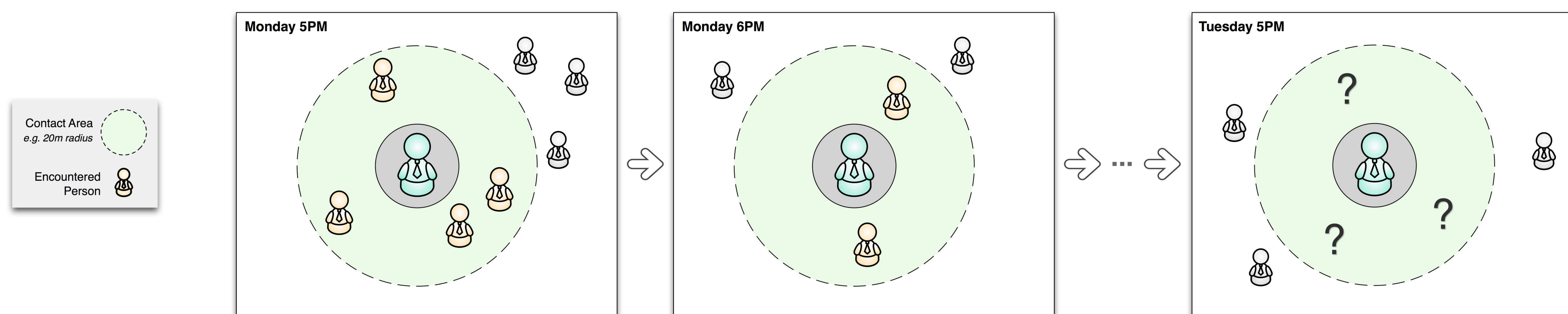


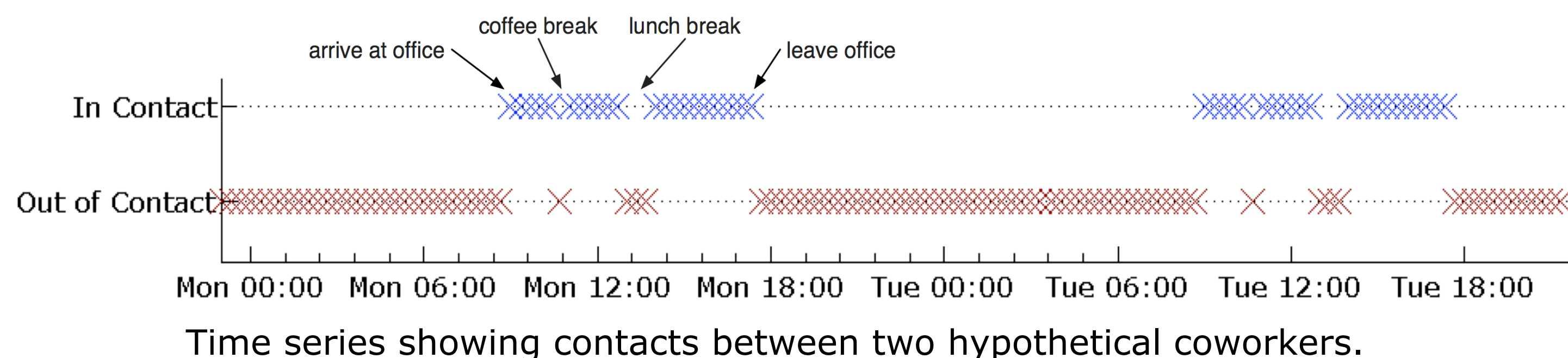
1. Introduction

- **Movement patterns** of humans are inherently non-random. As a result, the times at which people **encounter each other**, referred to as **contacts**, form **regular patterns**.
- Specifically, we are interested in contacts due to **proximity**; for example, **Bluetooth sightings**.
- The aim is to **dynamically predict** when an individual is likely to **encounter each of their associates** next, based on their **history of contacts**.



2. Representation

- An individual maintains a **contact history** for each other person they have encountered.
- A contact history is a **time series of binary values**. Periodic **samples** indicate whether the two people were in contact or not.



- **Contact-to-contact durations** and **contact lengths** can be derived.

3. Potential Approaches

Potential approaches for predicting future contacts include:

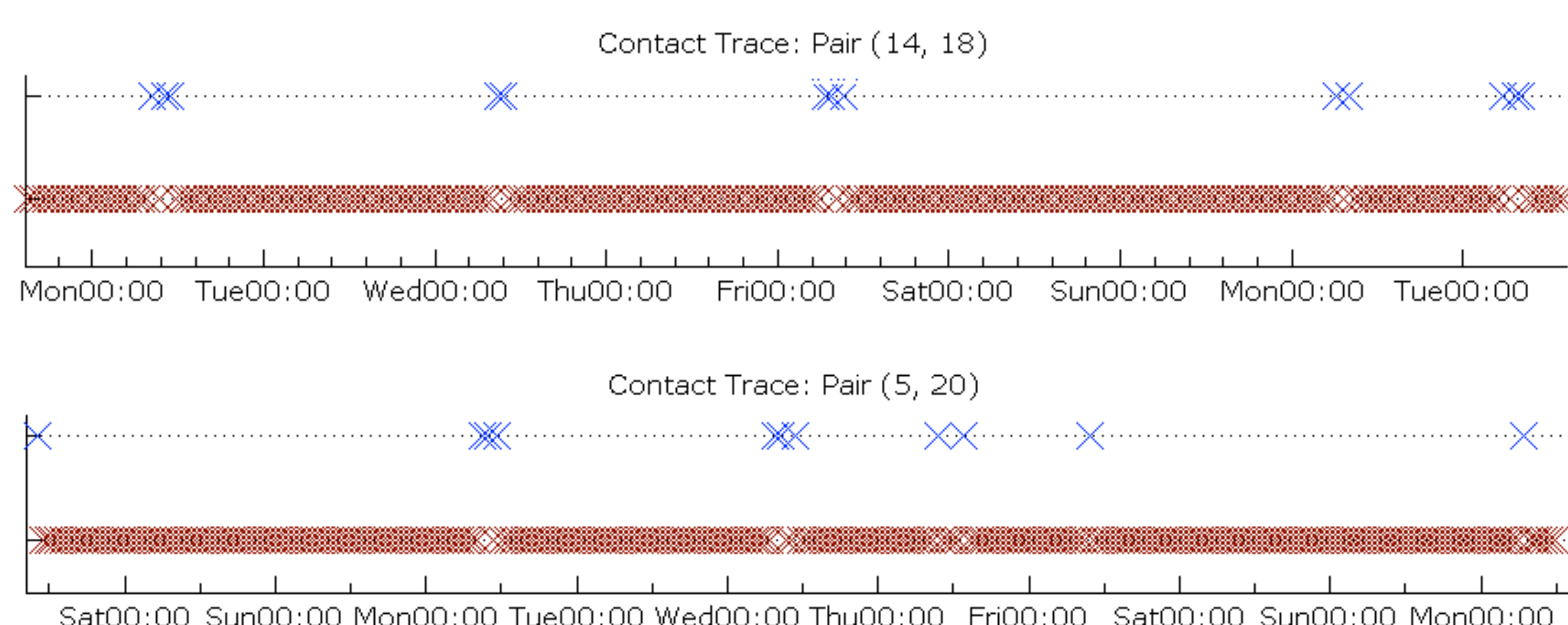
- **Linear prediction**. This is particularly promising because of its applications to **signals exhibiting periodicity**.
- Autoregressive moving average (**ARMA**) models.
- **Kalman filter** based prediction.
- Modelling contact history as an ***n*th-order Markov chain** and use **prediction by partial matching**.

0 0 1 0 0 1 0 0 1 0 0 1 0 0 1 ?
Example of a third-order Markov chain with binary values.

4. Evaluation

Proposed methods for evaluating solutions are:

- **Computer simulations** using appropriate **mobility models**.
- Deriving contacts from existing **trace data** produced from **real-world** experiments.



Contact histories of two pairs of participants in *Haggle Project's* 2005 experiment at Cambridge.

5. Future Work

- **Development, evaluation** and **refinement** of a **prediction model** for contact prediction.
- Survey of work by **anthropologists** which may lead to better understanding of the **underlying factors** that affect **human contact behaviour**.
- Introduction of **additional context** into the model. One example is to consider the **other individuals present** when an encounter occurs.
- Utilize contact prediction to develop **adaptive content sharing algorithms**. The overriding motivation for the contacts research is to enable effective content sharing in **mobile P2P networks**.