

PEOPLENET 10 QUESTIONS

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WHICH KIND OF RELATIONS EXISTS BETWEEN FACE-TO-FACE AND ONLINE CONTACTS?

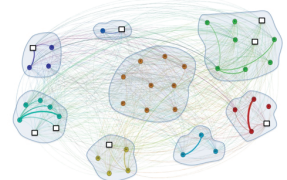
We had run an experiment involving a group of students which have recorded their face-to-face and online contacts for one month. The experiment allowed to build the students' bidimensional network and compare the face-to-face layer with the online one. Among all results the most interesting are: 1) the overlapping degree between the online and face-to-face sociality is quite low, 2) node centrality is not a universal feature as popularity of individuals is very likely to change in different networks, 3) the merging of the two social networks induces a different ranking on the nodes. Facebook structure and the weights inferred from face-to-face contacts play a fundamental role in making the centralities always different.

Gaito S., Rossi G. P., Zignani M. "Facencounter: bridging the gap between offline and online social networks". In Proc. IEEE 8th Int. Conference Signal Image Technology and Internet Based Systems (SITIS), Oct. 2012, pp. 768-775.

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HOW MUCH IS THE INFORMATION DISSEMINATION RELATED TO THE HUMAN MOBILITY BEHAVIOR?

Encounters are the unique "transmission media" for data dissemination in OppNets. Encounters are oddly distributed throughout the population: communities of encounters emerge from individuals' habits. Though, social relations and common interests do not perfectly match with encounter communities. In figure, the encounter communities in our department are shown, with people belonging to the Computer Network research group highlighted as white squares. Forwarding algorithms must thus be able to go through the boundaries of those communities - in order to reach the message destination(s) - by selecting appropriate "bridge" nodes.

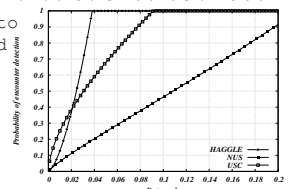


E. Pagani, G. P. Rossi, Interest-driven Forwarding for Delay-tolerant Mobile Ad Hoc Networks. In Proc. 9th IEEE International Wireless Communications and Mobile Computing Conference (IWCMC 2013), Cagliari (Italy), 2013.

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HOW MUCH DOES IT COST, IN TERMS OF BATTERY CONSUMPTION, A SMARTPHONE BASED OSM?

We analyze the possibility to use the WiFi technology by introducing a duty cycle to save energy: all devices have to be very coarsely synchronized and they turn on and off the wireless interface simultaneously, with a human time scale. In this way we can save part of the power accountable for keeping the WiFi radio interface always on. The drawback is depicted in the graph, where we can see the missed contact opportunities for a duty cycle of 5s ON and 25s OFF and a mobility model taken from the real mobility traces provided by MIT reality mining, Hagggle project and USC.



L.Bracciale, P. Loreti, G.Bianchi "Human Time-Scale Duty Cycle for Opportunistic WiFi Based Mobile Networks" submitted to the 24th Tyrrhenian International Workshop on Digital Communications

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WHICH ARE THE FORWARDING POLICIES THAT MAXIMIZE THE DELIVERY PROBABILITY?

We considered the problem of optimizing two-hop routing strategies in delay tolerant networks characterized by heterogeneous mobile nodes with different mobility patterns and transmission technologies. The routing problem is formalized as an optimization problem to maximize the packet delivery probability within given deadlines and under energy consumption constraints. We demonstrated that the optimal forwarding policy exhibits a threshold, as well as case of homogenous mobility nodes. Finally effective algorithms are proposed and numerically evaluated to derive the optimal routing policies.

N. Basilico, N. Gatti, M. Cesana, Beaconig-aware Optimal policies for two-hop routing in delay tolerant networks, paper under submission, more information by contacting Matteo Cesana (matteo.cesana@polimi.it)

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WHAT ARE THE RESULTS PRODUCED BY THIS PROJECT?

The PeopleNet project produced several scientific works presented in international conferences and peer reviewed journals, and software for mobile devices. For a detailed list, please visit our website:



[HTTP://PEOPLENET.NETGROUP.UNIRONA2.IT/](http://PEOPLENET.NETGROUP.UNIRONA2.IT/)



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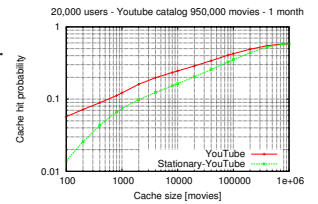
WHY ANOTHER PROJECT ON OPPORTUNISTIC NETWORKING?

More than four billions of people, today, have cellular phones usually equipped with short range wireless connectivity. This networking potential, might push forward a new generation of provider-less networks, the Opportunistic Social Networks (OSNs). PeopleNet is an Italian PRIN project that studies OSN with three major goals: 1) understand human mobility and social interaction, and boost their contact prediction capabilities by leveraging higher layer information such as social network communities first ranked e-mail destinations 2) devise improved intra- and inter-community message forwarding and data-centric content dissemination approaches exploiting slowly varying social relationships and contacts, as well as scheduled and predictable mobility 3) design a trustworthy forwarding mechanisms exploiting social and behavioural information in a trusted and privacy-preserving manner.

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HOW MUCH COULD AN EFFICIENT CACHING REDUCE NODES TRAFFIC?

In content-on-demand distribution over the Internet, in many scenarios (e.g., Video-on-Demand) the content requests exhibit a large degree of temporal locality. Thanks to this, a system of intermediate caches provides an efficient method for the user to reduce the latency and the capacity required to access the content. Temporal locality allows to reduce the cache size up to one order of magnitude with respect to the same requests pattern in which the temporal locality has been flushed out.



M. Ahmed, S. Traverso, P. Giaccone, E. Leonardi, and S. Niccolini. Analyzing the performance of LRU caches under non-stationary traffic patterns. CoRR, abs/1301.4909, 2013.

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DOES IT EXIST AT LEAST ONE OPPORTUNISTIC APPLICATION?

The killer application might be the dissemination of personalized ads (coupons, deals, newsletters, product catalogs) on an autonomous mobile social network. Indeed, a 2011 survey (*) by Google shows that 79% of smartphone consumers use their phones for shopping and 71% of them search a product after being exposed to online or offline advertisements.

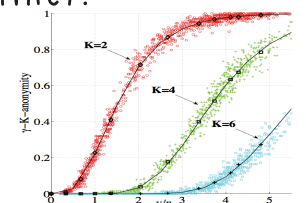


* G. O. MediaCT, "The Mobile Movement: Understanding Smartphone Users," in Google Inc., 2011.

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ARE BLOOM FILTERS A GOOD IDEA FOR PROVIDING PRIVACY?

Not so much. Their probabilistic operations, along with the implicit data representation, yield some ambiguity on the actual data stored, which, may be somewhat considered as a better than nothing privacy asset. We adapted the probabilistic anonymity metrics to the Bloom filter setting to quantify the granted privacy that depends from a privacy/utility trade-offs. In figure, the level of anonymity versus the utility of the filter. Filters with a good level of anonymity are barely usable.



G. Bianchi, L. Bracciale, P. Loreti "Better than Nothing Privacy with Bloom Filters: to what extent?" UNESCO Chair in Data Privacy, International Conference, PSD 2012, Palermo, Italy

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HOW CAN WE DYNAMICALLY LEARN THE MOST EFFICIENT FORWARDING POLICY?

The reference scenario is composed of delay tolerant networks with heterogeneous mobile nodes (different mobility patterns and different transmission technologies) which perform two-hop routing. The optimal routing strategies in this scenario can be derived when assuming a priori knowledge on the scenario parameters (node mobility, energy cost, etc.). We consider the case where this information is not available, but, on the other side, it must be learned online. Machine learning algorithms are proposed and evaluated to dynamically drive the routing strategies towards the optimal ones.

N. Basilico, N. Gatti, M. Cesana, "A learning algorithm to steer routing decisions in delay tolerant networks", work in progress, more information by contacting Matteo Cesana (matteo.cesana@polimi.it)



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