References

- [1] Gis commons. Last accessed March, 12th 2019 at: https://giscommons.org/introduction-concepts/.
- [2] Location-based services introduction. Last accessed January, 15th 2017 at: http://geoawesomeness.com/knowledge-base/location-basedservices/location-based-services-introduction/, 2011.
- [3] GPS overview. Last accessed January, 02nd 2017 at: http://www.gps.gov/systems/gps/, 2017.
- [4] Location based app development services. Last accessed January, 22nd 2017 at: https://www.rishabhsoft.com/mobile/location-basedapplication-development, 2017.
- [5] Location based services are playing a crucial role in mobile app development. Last accessed April, 02nd 2017 at: http://www.vensi.com/locationbased-services-are-playing-a-crucial-role-in-mobile-app-development/, 2017.
- [6] Worldwide quarterly mobile phone tracker. Last accessed January, 01st 2017 at: http://www.idc.com/tracker/showproductinfo.jsp?prod_id=37, 2017.
- [7] Knn classification using scikit-learn. Last accessed April, 16th 2019 at: https://www.datacamp.com/community/tutorials/k-nearestneighbor-classification-scikit-learn, 2018.
- [8] Ativity recognition alt 0.1.7. Last accessed November, 26th 2019 at: https://pub.dev/packages/activity_recognition_alt, 2019.
- [9] wifi 0.1.5. Last accessed November, 27th 2019 at: https://pub.dev/packages/wifi, 2019.

- [10] Worldwide smartphone shipments 1.0%up vear over vear despite in third quarter samsung galaxy note 7 recall, according to idc. Last accessed March. 28th 2019at: https://www.idc.com/getdoc.jsp?containerId=prUS41882816, 2019.
- [11] L. C. Allan Brimicombe. Location-based services and geo-information engineering. 2009.
- [12] J. Alvarez-Garcia, J. Ortega, L. Gonzalez-Abril, and F. Velasco-Morente. Trip destination prediction based on past gps log using a hidden markov model. *Expert Syst. Appl.*, 37:8166–8171, 12 2010.
- [13] G. Amalarethinam and F. Mary. Security and privacy issues in location based services(lbs) - a survey. 01 2014.
- [14] F. Anuar and U. Gretzel. Privacy concerns in the context of locationbased services for tourism. 01 2011.
- [15] D. Ashbrook and T. Starner. Starner, t.: Using gps to learn significant locations and predict movement across multiple users. personal and ubiquitous computing 7(5), 275-286. *Personal and Ubiquitous Computing*, 7:275-286, 10 2003.
- [16] U. Bareth. Algorithmic optimizations for energy-efficient monitoring of spatial objects on smartphones. In K. Fähnrich and B. Franczyk, editors, Informatik 2010: Service Science - Neue Perspektiven für die Informatik, Beiträge der 40. Jahrestagung der Gesellschaft für Informatik e.V. (GI), Band 1, 27.09. - 1.10.2010, Leipzig, Deutschland, volume P-175 of LNI, pages 577–582. GI, 2010.
- [17] U. Bareth. Privacy-aware and energy-efficient geofencing through reverse cellular positioning. In 2012 8th International Wireless Communications and Mobile Computing Conference (IWCMC), pages 153–158, Aug 2012.
- [18] J. Blumenthal, R. Grossmann, F. Golatowski, and D. Timmermann. Weighted centroid localization in zigbee-based sensor networks. In 2007 IEEE International Symposium on Intelligent Signal Processing, pages 1-6, Oct 2007.

- [19] F. Calabrese, G. Lorenzo, and C. Ratti. Human mobility prediction based on individual and collective geographical preferences. pages 312 – 317, 10 2010.
- [20] N. Chang, R. Rashidzadeh, and M. Ahmadi. Robust indoor positioning using differential wi-fi access points. *Consumer Electronics, IEEE Transactions on*, 56:1860 – 1867, 09 2010.
- [21] M. Y. Chen, T. Sohn, D. Chmelev, D. Haehnel, J. Hightower, J. Hughes, A. LaMarca, F. Potter, I. Smith, and A. Varshavsky. Practical metropolitan-scale positioning for GSM phones. In *Proceedings of the 8th International Conference on Ubiquitous Computing*, UbiComp'06, page 225–242, Berlin, Heidelberg, 2006. Springer-Verlag.
- [22] Y.-C. Cheng, Y. Chawathe, A. LaMarca, and J. Krumm. Accuracy characterization for metropolitan-scale wi-fi localization. In ACM MobiSys, pages 233–245, January 2005.
- [23] Y.-C. Cheng, Y. Chawathe, A. LaMarca, and J. Krumm. Accuracy characterization for metropolitan-scale wi-fi localization. pages 233–245, 01 2005.
- [24] S.-B. Cho. Exploiting machine learning techniques for location recognition and prediction with smartphone logs. *Neurocomputing*, 176, 05 2015.
- [25] Y. Chon, W. Ryu, and H. Cha. Predicting smartphone battery usage using cell tower ID monitoring. *Pervasive and Mobile Computing*, 13, 08 2014.
- [26] N. Deblauwe and P. Ruppel. Combining gps and gsm cell-id positioning for proactive location-based services. In Fourth Annual International Conference on Mobile and Ubiquitous System Networking & Services (MobiQuitous), pages 1–7, September 2007.
- [27] N. Deblauwe and P. Ruppel. Combining gps and gsm cell-id positioning for proactive location-based services. pages 1–7, 09 2007.
- [28] F. V. Diggelen and P. K. Enge. The world's first gps mooc and worldwide laboratory using smartphones. In *Proceedings of the 28th International Technical Meeting of the Satellite Division of The Institute of Navigation* (ION GNSS+ 2015), pages 361–369, September 2015.

- [29] G. Djuknic and R. Richton. Geolocation and assisted gps. Computer, 34:123 – 125, 03 2001.
- [30] T. Falkowski, M. Günther, C. Jürgenhake, H. Anacker, and R. Dumitrescu. Toward a design approach for industrial indoor location-based services. pages 1043–1054, 01 2018.
- [31] X. Ge and Z. Qu. Optimization wifi indoor positioning knn algorithm location-based fingerprint. pages 135–137, 08 2016.
- [32] T. Graf. Power-efficient positioning technologies for mobile devices. 2012.
- [33] A. Habibi Lashkari, B. Parhizkar, and M. Ngan. Wifi-based indoor positioning system. Computer and Network Technology, International Conference on, 0:76–78, 01 2010.
- [34] S. Hussain, M. Emran, S. Muhammad, S. Usman, N. Muhammad, S. Ahmed, and A. Muhammad. Positioning a mobile subscriber in a cellular network system based on signal strength. *IAENG International Journal of Computer Science*, 34, 11 2007.
- [35] D. Kim, S. Lee, and H. Bahn. An energy-efficient positioning scheme for location-based services in a smartphone. In 2016 IEEE 22nd International Conference on Embedded and Real-Time Computing Systems and Applications (RTCSA), pages 139–148, Aug 2016.
- [36] Y.-J. Kim and S.-B. Cho. A HMM-based location prediction framework with location recognizer combining k-nearest neighbor and multiple decision trees. pages 618–628, 09 2013.
- [37] C.-H. Lee, C.-M. Huang, and W.-S. Chen. A POI-aware power saving scheme for ubiquitous touring service using mobile devices over the cellular and wi-fi hybrid network. *Mobile Networks and Applications*, November 2015.
- [38] J.-K. Lee and J. Hou. Modeling steady-state and transient behaviors of user mobility. In 7th ACM Interational Symposium on Mobile Ad Hoc Networking and Computing, MobiHoc 2006, pages 85–96, January 2006.
- [39] Y. Lee, J. Lee, S. Dongsoo, and H. Choo. Energy-efficient adaptive localization middleware based on GPS and embedded sensors for smart

mobiles. In 2014 IEEE Fourth International Conference on Consumer Electronics Berlin (ICCE-Berlin), pages 126–130, Sep 2014.

- [40] J. Luo and L. Fu. A smartphone indoor localization algorithm based on whan location fingerprinting with feature extraction and clustering. *Sensors (Switzerland)*, 17, 06 2017.
- [41] P. S. Mane and V. Khairnar. Power efficient location based services on smart phones. 2013.
- [42] W. Mathew, R. Raposo, and B. Martins. Predicting future locations with hidden markov models. pages 911–918, 09 2012.
- [43] H. Mathkour. A GPS-based mobile dynamic service locator system. Applied Computing and Informatics, 9:95–106, 07 2011.
- [44] V. Mejot. Constellation arrangement. The Code Project, 2002.
- [45] F. Meneses and A. Moreira. Using gsm cellid positioning for place discovering. pages 1 – 8, 01 2007.
- [46] M. Mokbel. Privacy in location-based services: State-of-the-art and research directions. pages 228 – 228, 06 2007.
- [47] M. Morzy. Mining frequent trajectories of moving objects for location prediction. pages 667–680, 07 2007.
- [48] J. Paek, K.-H. Kim, J. Singh, and R. Govindan. Energy-efficient positioning for smartphones using cell-id sequence matching. pages 293–306, 01 2011.
- [49] J. Raper, G. Gartner, H. Karimi, and C. Rizos. Applications of locationbased services: A selected review. J. Locat. Based Serv., 1(2):89–111, June 2007.
- [50] Roebuck. Location-based services (LBS): High-impact strategies what you need to know: Definitions, adoptions, impact, benefits, maturity, vendors. 2011.
- [51] J. Schiller and A. Voisard. Location Based Services. Morgan Kaufmann Publishers Inc., San Francisco, CA, USA, 2004.

- [52] S. Wang, J. Min, and B. Yi. Location based services for mobiles :technologies and standards. *Proceedings of IEEE ICC 2008*, (Beijing, China), January 2008.
- [53] J. Willaredt. Wifi and cell-id based positioning-protocols, standards and solutions. 2011.
- [54] M. Youssef, M. A. Yosef, and M. El-Derini. GAC: Energy-efficient hybrid gps-accelerometer-compass GSM localization. In 2010 IEEE Global Telecommunications Conference GLOBECOM 2010, pages 1–5, Dec 2010.
- [55] P. Zandbergen and S. Barbeau. Positional accuracy of assisted gps data from high-sensitivity gps-enabled mobile phones. *Journal of Navigation*, 64:381 – 399, 07 2011.