

Acknowledgments

This material was funded by NSF grants IIS-1320620, CCF-1101668, and IIS-0964579, by an NDSEG fellowship, and used the Pittsburgh Supercomputing Center in partnership with the XSEDE, which is supported by NSF grant OCI-1053575. We thank Intel Corporation for machine gifts.

References

- Abraham, D.; Blum, A.; and Sandholm, T. 2007. Clearing algorithms for barter exchange markets: Enabling nationwide kidney exchanges. In *ACM Conference on Electronic Commerce (EC)*, 295–304.
- Anshelevich, E.; Chhabra, M.; Das, S.; and Gerrior, M. 2013. On the social welfare of mechanisms for repeated batch matching. In *Proceedings of the National Conference on Artificial Intelligence (AAAI)*, 60–66.
- Ashlagi, I., and Roth, A. E. 2011. Individual rationality and participation in large scale, multi-hospital kidney exchange. In *ACM Conference on Electronic Commerce (EC)*, 321–322.
- Ashlagi, I.; Gilchrist, D. S.; Roth, A. E.; and Rees, M. 2011. Nonsimultaneous chains and dominos in kidney-paired donation—revisited. *American Journal of Transplantation* 11(5):984–994.
- Ashlagi, I.; Gamarnik, D.; Rees, M.; and Roth, A. E. 2012. The need for (long) chains in kidney exchange. NBER Working Paper No. 18202.
- Ashlagi, I.; Jaillet, P.; and Manshadi, V. H. 2013. Kidney exchange in dynamic sparse heterogeneous pools. In *ACM Conference on Electronic Commerce (EC)*, 25–26.
- Awasthi, P., and Sandholm, T. 2009. Online stochastic optimization in the large: Application to kidney exchange. In *Proceedings of the 21st International Joint Conference on Artificial Intelligence (IJCAI)*, 405–411.
- Barnhart, C.; Johnson, E.; Nemhauser, G.; Savelsbergh, M.; and Vance, P. 1998. Branch-and-price: column generation for solving huge integer programs. *Operations Research* 46:316–329.
- Blum, A.; Gupta, A.; Procaccia, A. D.; and Sharma, A. 2013. Harnessing the power of two crossmatches. In *ACM Conference on Electronic Commerce (EC)*, 123–140.
- Brown, R. S. 2008. Live donors in liver transplantation. *Gastroenterology* 134(6):1802–1813.
- Cheah, Y. L.; Simpson, M. A.; Pomposelli, J. J.; and Pomfret, E. A. 2013. Incidence of death and potentially life-threatening near-miss events in living donor hepatic lobectomy: A world-wide survey. *Liver Transplantation* 19(5):499–506.
- Dickerson, J. P.; Procaccia, A. D.; and Sandholm, T. 2012a. Dynamic matching via weighted myopia with application to kidney exchange. In *Proceedings of the National Conference on Artificial Intelligence (AAAI)*, 1340–1346.
- Dickerson, J. P.; Procaccia, A. D.; and Sandholm, T. 2012b. Optimizing kidney exchange with transplant chains: Theory and reality. In *International Conference on Autonomous Agents and Multi-Agent Systems (AAMAS)*, 711–718.
- Dickerson, J. P.; Procaccia, A. D.; and Sandholm, T. 2013. Failure-aware kidney exchange. In *ACM Conference on Electronic Commerce (EC)*, 323–340.
- Dickerson, J. P.; Procaccia, A. D.; and Sandholm, T. 2014. Price of fairness in kidney exchange. In *International Conference on Autonomous Agents and Multi-Agent Systems (AAMAS)*.
- Egawa, H.; Oike, F.; Buhler, L.; Shapiro, A.; Minamiguchi, S.; Haga, H.; Uryuhara, K.; Kiuchi, T.; Kaihara, S.; and Tanaka, K. 2004. Impact of recipient age on outcome of ABO-incompatible living-donor liver transplantation. *Transplantation* 77(3):403.
- Gentry, S. E., and Segev, D. L. 2011. The honeymoon phase and studies of nonsimultaneous chains in kidney-paired donation. *American Journal of Transplantation* 11(12):2778–2779.
- Gentry, S. E.; Montgomery, R. A.; Swihart, B. J.; and Segev, D. L. 2009. The roles of dominos and nonsimultaneous chains in kidney paired donation. *American Journal of Transplantation* 9(6):1330–1336.
- Hwang, S.; Lee, S.-G.; Moon, D.-B.; Song, G.-W.; Ahn, C.-S.; Kim, K.-H.; Ha, T.-Y.; Jung, D.-H.; Kim, K.-W.; Choi, N.-K.; Park, G.-C.; Yu, Y.-D.; Choi, Y.-I.; Park, P.-J.; and Ha, H.-S. 2010. Exchange living donor liver transplantation to overcome ABO incompatibility in adult patients. *Liver Transplantation* 16(4):482–490.
- Krivelevich, M.; Lubetzky, E.; and Sudakov, B. 2013. Longest cycles in sparse random digraphs. *Random Struct. Algorithms* 43(1):1–15.
- McDowell, M.; Fryar, C.; Ogden, C.; and Flegal, K. 2008. Anthropometric reference data for children and adults: United States, 2003–2006. *Nutrition* 10(10):1–45.
- Rapaport, F. T. 1986. The case for a living emotionally related international kidney donor exchange registry. *Transplantation Proceedings* 18:5–9.
- Rees, M.; Kopke, J.; Pelletier, R.; Segev, D.; Rutter, M.; Fabrega, A.; Rogers, J.; Pankewycz, O.; Hiller, J.; Roth, A.; Sandholm, T.; Ünver, U.; and Montgomery, R. 2009. A nonsimultaneous, extended, altruistic-donor chain. *New England Journal of Medicine* 360(11):1096–1101.
- Roth, A.; Sönmez, T.; and Ünver, U. 2004. Kidney exchange. *Quarterly Journal of Economics* 119(2):457–488.
- Roth, A.; Sönmez, T.; and Ünver, U. 2007. Efficient kidney exchange: Coincidence of wants in a market with compatibility-based preferences. *American Economic Review* 97:828–851.
- Saidman, S. L.; Roth, A.; Sönmez, T.; Ünver, U.; and Delmonico, F. 2006. Increasing the opportunity of live kidney donation by matching for two and three way exchanges. *Transplantation* 81(5):773–782.
- Ünver, U. 2010. Dynamic kidney exchange. *Review of Economic Studies* 77(1):372–414.
2007. United States Renal Data System (USRDS). <http://www.usrds.org/>.
- Woodle, S.; Daller, J.; Aeder, M.; Shapiro, R.; Sandholm, T.; Casingal, V.; Goldfarb, D.; Lewis, R.; Goebel, J.; and Siegler, M. 2010. Ethical considerations for participation of nondirected living donors in kidney exchange programs. *American Journal of Transplantation* 10:1460–1467.