References for SSE Ticket to Ride Expansion Pack

This is the reference list for 'Ticket to Sustainability'! This booklet serves as a curated compilation of references to relevant literature for further exploration of the SSE patterns and topics covered in the game. The references are organized based on the categories of cards in the game. Happy learning!

References for the Al Cards

- [1] Benedetta Brevini. "Black boxes, not green: Mythologizing artificial intelligence and omitting the environment". In: *Big Data & Society* 7.2 (2020).
- [2] Stephanie Glen. *Green AI tackles effects of AI, ML on climate change*. July 2022. URL: https://www.techtarget.com/searchenterpriseai/feature/Green-AI-tackles-effects-of-AI-ML-on-climate-change (visited on 03/29/2023).
- [3] Zhuohan Li et al. "Train big, then compress: Rethinking model size for efficient training and inference of transformers". In: *International Conference on machine learning*. PMLR. 2020, pp. 5958–5968.
- [4] Roy Schwartz et al. *Green Al.* 2019. arXiv: 1907.10597 [cs.CY].
- [5] Aimee Van Wynsberghe. "Sustainable AI: AI for sustainability and the sustainability of AI". In: *AI and Ethics* 1.3 (2021), pp. 213–218.
- [6] Roberto Verdecchia et al. "Data-centric green ai an exploratory empirical study". In: 2022 International Conference on ICT for Sustainability (ICT4S). IEEE. 2022, pp. 35–45.
- [7] Carole-Jean Wu et al. "Sustainable Al: Environmental Implications, Challenges and Opportunities". In: Proceedings of Machine Learning and Systems. Ed. by D. Marculescu, Y. Chi, and C. Wu. Vol. 4. 2022, pp. 795—813. URL: https://proceedings.mlsys.org/paper_files/paper/2022/file/ed3d2c21991e3bef5e069713af9fa6ca-Paper.pdf.
- [8] Tim Yarally. Green Al: An empirical study. 2022. URL: http://resolver.tudelft.nl/uuid:a3de8838-8e9a-4c70-8a04-a9f296be7c84.

References for the Data Center Cards

- [1] Dinh-Mao Bui et al. "Energy efficiency for cloud computing system based on predictive optimization". In: *Journal of Parallel and Distributed Computing* 102 (2017), pp. 103–114.
- [2] Victor Depoorter, Eduard Oró, and Jaume Salom. "The location as an energy efficiency and renewable energy supply measure for data centres in Europe". In: *Applied Energy* 140 (2015), pp. 338–349.
- [3] Xiaowen Dong, Taisir El-Gorashi, and Jaafar MH Elmirghani. "Green IP over WDM networks with data centers". In: *Journal of Lightwave Technology* 29.12 (2011), pp. 1861–1880.
- [4] Eduard Oró et al. "Energy efficiency and renewable energy integration in data centres. Strategies and modelling review". In: *Renewable and Sustainable Energy Reviews* 42 (2015), pp. 429–445.
- [5] Ehsan Pakbaznia and Massoud Pedram. "Minimizing data center cooling and server power costs". In: *Proceedings of the 2009 ACM/IEEE international symposium on Low power electronics and design.* 2009, pp. 145–150.
- [6] Nikitha Sattiraju. The Secret Cost of Google's Data Centers: Billions of Gallons of Water to Cool Servers. 2020. URL: https://time.com/5814276/google-data-centers-water/.
- [7] Subhadra Bose Shaw and Anil Kumar Singh. "Use of proactive and reactive hotspot detection technique to reduce the number of virtual machine migration and energy consumption in cloud data center". In: *Computers & Electrical Engineering* 47 (2015), pp. 241–254.
- [8] Severin Zimmermann et al. "Aquasar: A hot water cooled data center with direct energy reuse". In: *Energy* 43.1 (2012), pp. 237–245.

References for the Design Patterns I & II Cards

- [1] Rutger Alders. "Energy Efficient Design Patterns". Patterns: Template Method, State/Strategy. University of Groningen, 2016.
- [2] Christian Bunse and Sebastian Stiemer. "On the Energy Consumption of Design Patterns". In: *Softwaretechnik-Trends* 33 (2 May 2013). Patterns: Facade, Observer, Abstract Factory, Decorator, Prototype, Template Method, pp. 7–8. DOI: 10.1007/s40568-013-0020-6.
- [3] Daniel Feitosa et al. "Investigating the effect of design patterns on energy consumption". In: *Journal of Software: Evolution and Process* 29 (2 Feb. 2017). Patterns: State/Strategy, Template Method. ISSN: 2047-7481. DOI: 10.1002/SMR.1851.
- [4] Martin Fowler. *Refactoring: Improving the Design of Existing Code*. 2nd ed. Addison-Wesley, 2019. URL: https://martinfowler.com/books/refactoring.html.
- [5] Andreas Litke et al. "Energy Consumption Analysis of Design Patterns". In: *International Journal of Energy and Power Engineering* 1 (11 Nov. 2007), pp. 1663–1667. DOI: 10.5281/zenodo.1057717.
- [6] Sepideh Maleki et al. "Understanding the Impact of Object Oriented Programming and Design Patterns on Energy Efficiency". In: Patterns: Decorator, Facade, Flyweight, Prototype, Template Method;br/¿OOP: inheritance, polymorphism, operator overloading. IEEE, 2019, pp. 1–6. ISBN: 9781538634707. DOI: 10.1109/IGCC.2017.8323605.
- [7] Adel Noureddine and Ajitha Rajan. "Optimising Energy Consumption of Design Patterns". In: Patterns: Observer and Decorator. May 2010, pp. 623–626. DOI: 10.1109/ICSE.2015.208.
- [8] Awais Qasim et al. "Evaluating the Impact of Design Pattern Usage on Energy Consumption of Applications for Mobile Platform". In: *Applied Computer Systems* 26 (1 June 2021). Patterns: Facade, Observer, Singleton, Abstract Factory, Template Method, pp. 1–11. ISSN: 2255-8683. DOI: 10.2478/acss-2021-0001.
- [9] Cagri Sahin et al. "Initial Explorations on Design Pattern Energy Usage". In: Patterns: many. June 2012, pp. 55–61. ISBN: 9781467318327.

For easy comparison between the different studies, the tables below contain a complete overview of the results from all papers analyzed. The percentages indicate how the design pattern solutions perform relative to their non-pattern alternative, for each study.

					Design Pa	ttern			
Paper	Focus	Abstract Factory	Adapter	Bridge	Builder		Chain	Command	Composite
Alders 2016 / Feitosa 2017	Java								
Bunse 2013	Java (mobile systems)	+15.9%							
Litke 2007	C++ (embedded systems)		+0.1-0.3%						
Maleki 2019	OOP								
Noureddine 2010*	C++, Java	+4.5%	-0.5%	+4%		-2%	+2%		-1.5%
Qasim 2021	Mobile systems (Android)	-65-61%							
Sahin 2012	C++	+21.6%		-0.2%	+1.2%			-1.8%	+5.1%
		•							

					Design Pattern			
Paper	Focus	Decorator	Facade	Factory Method	Flyweight	Interpreter	Iterator	Mediator
Alders 2016 / Feitosa 2017	Java							
Bunse 2013	Java (mobile systems)	+133.6%	+2.5%					
Litke 2007	C++ (embedded systems)			+0.1-0.3%				
Maleki 2019	OOP	+496.6%	-4.3%		-49.7%			
Noureddine 2010*	C++, Java	+12.24%		+3%	-2.5%	-33%	+7%	+26.61%
Qasim 2021	Mobile systems (Android)		-61-22%					
Sahin 2012	C++	+712.9%		-0.1%	-58.1%			-9.6%

					Design Pattern			
Paper	Focus	Observer	Prototype	Proxy	Singleton	State/Strategy	Template Method	Visitor
Alders 2016 / Feitosa 2017	Java					+115.9-124.8%	+21.1-32.2%	
Bunse 2013	Java (mobile systems)	+0.1%	+33.2%				+0.1%	
Litke 2007	C++ (embedded systems)	+43.6-44.5%						
Maleki 2019	OOP		+0.6%				+0.8%	
Noureddine 2010*	C++, Java	+30.63%	0%	+1.5%	-3.5%	+3%/-3.5%	+9%	+3.5%
Qasim 2021	Mobile systems (Android)	-91-89.3%			+10%, +105%		-41%, +89%	
Sahin 2012	C++	+62.2%	-0.9%	-36.5%	+0.4%	-0.2%		-7.5%

^{*} This source contains a visual graph rather than exact numbers for most design patterns; the numbers are therefore estimates.

References for the Mobile Cards

- [1] Tedis Agolli, Lori Pollock, and James Clause. "Investigating decreasing energy usage in mobile apps via indistinguishable color changes". In: 2017 IEEE/ACM 4th International Conference on Mobile Software Engineering and Systems (MOBILESoft). IEEE. 2017, pp. 30–34.
- [2] Abhijeet Banerjee and Abhik Roychoudhury. "Automated re-factoring of android apps to enhance energy-efficiency". In: *Proceedings of the International Conference on Mobile Software Engineering and Systems*. 2016, pp. 139–150.
- [3] Lingfeng Bao et al. "How Android app developers manage power consumption? An empirical study by mining power management commits". In: *Proceedings of the 13th International Conference on Mining Software Repositories*. 2016, pp. 37–48.
- [4] Luís Cruz and Rui Abreu. "Catalog of energy patterns for mobile applications". In: *Empirical Software Engineering* 24 (Aug. 2019). DOI: 10.1007/s10664-019-09682-0.
- [5] Yepang Liu et al. "Understanding and detecting wake lock misuses for android applications". In: *Proceedings of the 2016 24th ACM SIGSOFT International Symposium on Foundations of Software Engineering.* 2016, pp. 396–409.
- [6] Grace Metri et al. "What is eating up battery life on my SmartPhone: A case study". In: 2012 International Conference on Energy Aware Computing. IEEE. 2012, pp. 1–6.

References for the Dirty Cards

- [1] Norm Bourassa et al. "Green Gaming: Energy Efficiency without Performance Compromise". In: (2018).
- [2] Electricity usage of a Game Console. 2023. URL: https://energyusecalculator.com/electricity_gameconsole.htm (visited on 04/17/2023).
- [3] Oscar Gonzalez. *Bitcoin Mining: How Much Electricity It Takes and Why People Are Worried*. Aug. 2022. URL: https://www.cnet.com/personal-finance/crypto/bitcoin-mining-how-much-electricity-it-takes-and-why-people-are-worried/ (visited on 04/17/2023).
- [4] Greenland. 2021. URL: https://www.eia.gov/international/overview/country/GRL (visited on 04/17/2023).
- [5] Kasper Groes Albin Ludvigsen. *ChatGPT's Electricity Consumption*. Mar. 2023. URL: https://towardsdatascience.com/chatgpts-electricity-consumption-7873483feac4 (visited on 04/17/2023).
- [6] How much electricity does Youtube use? Nov. 2019. URL: https://thefactsource.com/how-much-electricity-does-youtube-use/(visited on 04/17/2023).
- [7] Price cap for gas, electricity and district heating. 2023. URL: https://www.government.nl/topics/energy-crisis/cabinet-plans-price-cap-for-gas-and-electricity (visited on 04/17/2023).
- [8] RoutePlanner. 2023. URL: https://www.anwb.nl/verkeer/routeplanner?displayType=instructions (visited on 04/17/2023).
- [9] Samsung RB36T602CSA. 2023. URL: https://www.coolblue.nl/product/869348/samsung-rb36t602csa.html (visited on 04/17/2023).
- [10] Severin Zimmermann et al. "Aquasar: A hot water cooled data center with direct energy reuse". In: *Energy* 43.1 (2012), pp. 237–245.