Annotated Bibliography

Derboven, J., Huyghe, J., & De Grooff, D. (2014). Designing voice interaction for people with physical and speech impairments. In Proceedings of the 8th Nordic Conference on Human-Computer Interaction Fun, Fast, Foundational - NordiCHI '14(pp. 217–226). New York, New York, USA: ACM Press. https://doi.org/10.1145/2639189.2639252

Reflection: This paper talks about the use of voice technology in helping elderly people with problems of cognitive impairment. The experiment described in this paper tested various elderly people with Mild Cognitive Impairment (MCI), as well as elderly people with other cognitive problems. They listened to the users address a speech interface to determine the general trend of the way that this demographic talks to machines. A specific speech-recognition system, called ALADIN, was designed to "learn" in accordance with what the users said. This paper called to my attention the importance of user-tested design. The conclusions of the experiment support that people with physical, speech, and memory impairments will benefit from the use of speech recognition technology, provided changes are made using careful design to currently existing voice technology. This paper made me very interested in the subject of voice technology and its applications to helping people with cognitive impairment.

Gini, Maria, et al. "Auctioning Robotic Tasks With Overlapping Time Windows ..." *Magnet Journal*, 4 June 2012. Accessed 27 Sept. 2017.

Reflection: I think the type of technology mentioned in this article will be very useful in the field of robotics and development of artificial intelligence in the future, because allowing robots to be able to take into account factors such as time constraint and allocations of materials and resources while they are performing tasks is something that could definitely advance the "intelligence" of robots by allowing them the capabilities of doing more tasks than they may have previously been able to do. This type of mechanization of robots may also (far in the future) help robots more human-like and allow them to be able to assist people in larger ways than they do currently.

Karumur, R. P., Nguyen, T. T., & Konstan, J. A. (2016, November 19). Exploring the value of personality in predicting rating behaviors: A study of category preferences on movielens. Retrieved October 25, 2017, from https://experts.umn.edu/en/publications/exploring-the-value-of-personality-in-predicting-rating-behaviors

Abstract: Prior work relevant to incorporating personality into recommender systems falls into two categories: social science studies and algorithmic ones. Social science studies of preference have found only small relationships between personality and category preferences, whereas, algorithmic approaches found a little improvement when incorporating personality into

recommendations. As a result, despite good reasons to believe personality assessments should be useful in recommenders, we are left with no substantial demonstrated impact. In this work, we start with user data from a live recommender system, but study category-by-category variations in preference (both rating levels and distribution) across different personality types. By doing this, we hope to isolate specific areas where personality is most likely to provide value in recommender systems, while also modeling an analytic process that can be used in other domains. After controlling for the family-wise error rate, we find that High Agreeableness users rate at least 0.5 stars higher on a 5-star scale compared to low Agreeableness users. We also find differences in consumption in four different personality types between people who manifested high and low levels of that personality.
Reflection: I think it is very interesting that there is such a large connection between psychology and technology, and that studying personalities and preferences of various demographics can have such a large effect on not only where certain products get sold, but on what new technologies get created. Even surveying things like movie ratings made by people, which is one of the survey types the paper discusses, can give companies and entrepreneurs such a large input on what it is that people want, need, or would be interested in, and this allows them to create new types of technology that will be useful, rather than something that they aren't entirely sure about.

Moore, R. K., & Nicolao, M. (2017). Toward a Needs-Based Architecture for 'Intelligent' Communicative Agents: Speaking with Intention. Frontiers in Robotics and AI, 4. https://doi.org/10.3389/frobt.2017.00066

Reflection: In this paper, the potential for robots is discussed in the medical field; specifically, robots that could perform a social role or augment individual human capabilities through cognitive prosthetics. Challenges include tailoring/changing the technology to benefit each individual person, and the changing needs and abilities of people with dementia. Dementia brings reduced ability for new learning, which could impact use of technology. We need to understand how people with dementia embrace new technology, so computer literacy is important. Computer programs with cognitive training applications show improvements – for example, there is social robot therapy (this creates stimulating interaction and shows improvement in brain activity). Barriers include lack of usability, problems with access to health IT application, low computer literacy, confidentiality of patient information (there is an ethical issue – with more safety comes removal of some aspects of privacy, also obtaining informed consent from people with dementia due to possible difficulties in understanding complex technology). I think it is very interesting that robots have such a large potential in an area that has historically been so complex, especially given the target demographic is elderly people, who are not generally the primary target for such technology.

Meiland, F., et al. (2017). "Technologies to Support Community-Dwelling Persons With Dementia: A Position Paper on Issues Regarding Development, Usability, Effectiveness and Cost-Effectiveness, Deployment, and Ethics" Retrieved October 14, 2017.
www.bing.com/cr?IG=43AC405B2827416395B97BE73FCD8CD4&CID=32A06C7666CE619610DB67D967616071&rd=1&h=WGcsGPvxiZEwCIGOzyEA2Du5YKDZ1

0Ey8BR-Uw4udPw&v=1&r=http%3a%2f%2frehab.jmir.org%2farticle%2fviewFile%2frehab_v4i1e1%2f2&p=DevEx,5064.1.

Reflection: This paper talks about technologies to help people dealing with dementia – there have been general positive responses by people with dementia (they are enthusiastic toward these technologies). These are applications to help manage everyday life (like electronic calendars with reminders, medication reminders, robotic aids to perform daily tasks), engage in pleasurable activities, and to support professional organizations. There could be devices that are restructured for this purpose, or brand new devices. Some GPS type of devices could also be helpful to help families keep track of their location. Personalized technology is needed, because dementia has individual variations in needs and abilities. Overall, I have learned a lot about the problem of dementia and the potential solutions from reading this paper.

Milhorat, P., Schlogl, S., Chollet, G., Boudy, J., Esposito, A., & Pelosi, G. (2014). Building the next generation of personal digital assistants. In 2014 1st International Conference on Advanced Technologies for Signal and Image Processing, ATSIP 2014(pp. 458–463). IEEE Computer Society. https://doi.org/10.1109/ATSIP.2014.6834655

Reflection: This paper talks about several different potential future digital assistants. First is a memory notebook, which helps individuals with MCI (mild cognitive impairment). The idea of a smart environment is an environment that can acquire and apply knowledge about the resident's experiences – it can provide continual and more proactive assessment of health and cognitive status. Sensors are technology that can allow and unobtrusive way to monitor compliance with pharmaceutical regiments, socialization, and rehabilitation guidelines – this results in better patient outcomes. There are challenges with healthcare integration – technology is often developed without understanding of specific needs of users/patients; privacy/security is a concern to many families, because tech could lead to decreased social contact by replacing caregiver-patient interaction. The technology also has some problems: reliability and longevity of sensors, and the ability to develop and manufacture small, inexpensive sensors.

Narain, R., et al. (2017). "Implicit Crowds: Optimization Integrator for Robust Crowd Simulation" Retrieved October 4, 2017.

Abstract: Large multi-agent systems such as crowds involve inter-agent interactions that are typically anticipatory in nature, depending strongly on both the positions and the velocities of agents. We show how the nonlinear, anticipa- tory forces seen in multi-agent systems can be made compatible with recent work on energy-based formulations in physics-based animation, and propose a simple and e ective optimization-based integration scheme for implicit integration of such systems. We apply this approach to crowd simulation by using a state-of-the-art model derived from a recent analysis of human crowd data, and adapting it to our framework. Our approach provides, for the rst time, guaranteed collision-free motion while simultaneously maintaining high-quality collective behavior in a way that is insensitive to simulation parameters such as time step size and crowd density. ese bene ts are demonstrated through simulation results on various challenging scenarios and validation against real-world crowd data.

Reflection: Crowd simulation is a very interesting new type of technology - modelling human patterns of movement and behavior in order to figure out maximization of people for commercial buildings - this could be a large improvement in the field of urban safety and in emergency situations like evacuations of buildings (to possibly figure out maximum capacity and the best way for large crowds to exit buildings), as well as to help with more realistic depictions in animations.

Peetoom, K., et al. (2015). "Literature review on monitoring technologies and their outcomes in independently living elderly people" Retrieved December 14, 2017. www.bing.com/cr?IG=054EC974FF4B484FA3D49CAF15FBEF7C&CID=1D4B839F5711610D32BA883056BE60E6&rd=1&h=rdIB9OZvSMVSMNNp6T3ve0cLaT1SjSEAS_xK36cISXU&v=1&r=https%3a%2f%2fwww.researchgate.net%2fprofile%2fKirsten_Peetoom3%2fpublication%2f266086777_Literature_review_on_monitoring_technologies_and_their_outcomes_in_independently_living_elderly_people%2flinks%2f55d72cf208aed6a199a6735c.pdf&p=DevEx,5065.1.

Reflection: This paper talks about how monitoring technology will help create a more efficient healthcare system and allow elderly people to live more independently. Tele-monitoring systems could determine remotely the functional health status of elderly people, as well as detect daily activity. There are many different types of technology/systems that could help elderly people. Passive infrared motion sensors collect data about predefined activities within home – they are fairly accurate (25-100%), and have a low margin of error. Body-worn sensors are wearable sensors to detect activity and posture – accelerometers are also used to detect the degree of activity; sensitivity and specificity are high, and it is fairly accurate (59 – 95%). Video monitoring can be used to to detect activity and locate residents in their homes – they detect activity through silhouettes, background subtraction, or ellipse tracking algorithms; it is very accurate (74-100%), low false detection rates. Sound recognition uses microphones to detect different classes of activity – it determines maximum force on grab bars and sensors – fairly accurate (76 – 92%). Smart homes are a living/working environments constructed to assist people carrying on required activities – home is fitted with devices like sensors and biomedical monitors – operates within a network --- data is transferred to a remote center for collection and processing. Multicomponent monitoring technologies combine many monitoring technologies – usually PIR and video monitoring; accuracy is anywhere from 50 – 100%, but this type of technology leads to increased sense in safety and quality of life (but not significant increase).

Ries, Brian, et al. "Analyzing the Effect of a Virtual Avatar's Geometric and Motion Fidelity on Ego-Centric Spatial Perception in Immersive Virtual Environments." *Proceedings of the 16th ACM Symposium on Virtual Reality Software and Technology - VRST '09*, 2009, doi:10.1145/1643928.1643943.

Abstract: Researchers have begun work on several types of avatars involved in Virtual Reality experimentation. The avatars described in this paper are stiff avatar, dot avatar, and a simple avatar, all which use different technologies to serve a similar purpose; to act as a self-avatar for someone using virtual reality software. Direct blind walking was used with a variety of different

participants, all of whom were immersed in a virtual environment and asked to do such tasks as talk across the room to a certain spot. A high-fidelity 3D model of a hallway in the building was used as the virtual environment and the results were then analyzed; they showed, most commonly, a larger margin of error in the virtual environment than the real one - the experiment was repeated with no avatar, a simple avatar, stiff avatar, and dot avatar. The results showed that behavior was most optimal in environments where participants used a regular avatar to act as themselves.

Reflection: I think that this technology will have great implications on the rapidly-growing field of virtual reality technology, and it will be very interesting to see if/how this is able to develop into full-scale complete avatars (including something like a virtual mirror that mimics a person's face) that could create completely immersive virtual environments that don't quite exist today.

Schmitter-Edgecombe, M., et al. (2017) Technologies for Health Assessment, Promotion, and assistance: Focus on Gerontechnology" Retrieved November 3, 2017. www.bing.com/cr?IG=8651F02FEE4043C69FCE639D4B9B46C6&CID=3E4B686E91F067F93D3C63C1905F66DC&rd=1&h=LsjP--2Xw83WnSWvD46IPeKtgSS63hXEdqoP4yiAvRY&v=1&r=https%3a%2f%2flink.springer.com%2fcontent%2fpdf%2f10.1007%252F978-1-4614-6605-5_8.pdf&p=DevEx,5067.1./Using_Social_Psychology_to_Motivate_Contributions_to_Online_Communities

Reflection: This paper argues that technology is needed at this point in time to assist the elderly (specifically with cognitive impairment). Innovation should be focused in early detection of dementia, independent living of patients, safety and security, behavioral change, social support, and caregiver aid. Gerontechnology combines gerontology and technology – it involves study of aging and technology for benefit of preferred living and working environment and adapted medical care for elderly and their caregivers. Technology can be used for in-home monitoring (like glucometers for diabetics), service delivery (tele-assessment), and peer support. There could be applications like smart phones with sensors that track where people are, clarify what they are doing, and make suggestions for healthy activities.

Schrater, Paul, et al. Structure Learning in Human Sequential Decision-Making. (n.d.). Retrieved November 1, 2017, from https://www.bing.com/cr?IG=0360DCE1B8A8410C9A6FC277E1F2BC03&CID=2E868EC2E6E5634913DB85EFE7E3621C&rd=1&h=8V6qv2sIsyFYnt9rbX0rPfpb-IurHR5KAr2zm9ABDxY&v=1&r=https%3a%2f%2fwww.researchgate.net%2fprofile%2fPaul_Schrater%2fpublication%2f49677656_Structure_Learning_in_Human_Sequential_Decision-Making%2flinks%2f09e415101611950b14000000.pdf&p=DevEx,5062.1

Abstract: Studies of sequential decision-making in humans frequently find suboptimal performance relative to an ideal actor that has perfect knowledge of the model of how rewards and events are generated in the environment. Rather than being suboptimal, we argue that the

learning problem humans face is more complex, in that it also involves learning the structure of reward generation in the environment. We formulate the problem of structure learning in sequential decision tasks using Bayesian reinforcement learning, and show that learning the generative model for rewards qualitatively changes the behavior of an optimal learning agent. To test whether people exhibit structure learning, we performed experiments involving a mixture of one-armed and two-armed bandit reward models, where structure learning produces many of the qualitative behaviors deemed suboptimal in previous studies. Our results demonstrate humans can perform structure learning in a near-optimal manner.
Reflection: I think it is very interesting how studying structured learning and decision making patterns in humans can tell us so much about how well humans can perform and will be able to perform in the future. Even small amounts of information about sequential decision tasks can give someone a lot of information about things from how people in a company will be able to handle certain amounts of work (to be able to manage how much can and will be done in the future using modelling), to how users will react to a device based on how "useful" it is to their daily lives.

Shimizu, C., & Meyer, G. M. (2015). A computer aided color appearance design system for metallic car paint. ***Unknown Journal*****,** ***2015-January***

An interactive program has been developed to assist in the design of new goniochromatic colors. The program gives the user a unique set of controls over a second order polynomial that defines these color families at a sequence of aspecular reflection angles. One approach, based on traditional metallic colors, allows the user to adjust the average hue, saturation, and brightness of all of the colors interpolated by the polynomial. Another method, appropriate for the newer effect colors, permits the designer to establish face and flop colors to be reached at either end of the interpolation. In a final technique, variations produced by adjusting model parameters can be evaluated and selected.
Reflection: I think that this type of technology will be very useful in the field of computer graphics, because the types of metallic and goniochromatic colors that are generated create a new spectrum for animation and technological design, as well as how realistic it can be; also, a program that allows users to combine various hues and spectrums of metallic colors will definitely be able to create a more realistic and wide-spread online visual experience.

Terveen, L. (n.d.). Using Social Psychology to Motivate Contributions to Online Communities. Retrieved October 17, 2017, from https://www.academia.edu/4906723/Using_Social_Psychology_to_Motivate_Contributions_to_Online_Communities

Abstract: Under-contribution is a problem for many online communities. Social psychology theories of social loafing and goal-setting can provide mid-level design principles to address this problem. We tested the design principles in two field experiments. In one, members of an online movie recommender community were reminded of the uniqueness of their contributions and the benefits that follow from them. In the second, they were given a range of individual or group goals for contribution. As predicted by theory, individuals contributed when they were reminded of their uniqueness and when they were given specific and challenging goals, but other

predictions were not borne out. The paper ends with suggestions and challenges for mining social science theories as well as implications for design.
Reflection: The connection between the rise of computer science and social psychology is very interesting - it is surprising that user testing and the use of design principles can have such a large impact on the human-computer interaction of various technological products. It's also fascinating that the motivating factors in people to contribute to various online communities can be so useful in creating new products, because of the consumer aspect of the system.

Tokekar, P., Bhadauria, D., Studenski, A., & Isler, V. (2015, June 25). A robotic system for monitoring carp in minnesota lakes. Retrieved December 06, 2017, from https://experts.umn.edu/en/publications/a-robotic-system-for-monitoring-carp-in-minnesota-lakes

Reflection: It's very interesting how a monitoring system can be created to collect data from places that would seem difficult to reach, like the bottom of lakes. The concept of a robotic raft that can tag and monitor fish that swim in incredibly low depths of lakes is incredible, and could potentially prove useful for future endeavors such as ocean exploration (as this technology advances). RSNs (robotic sensor networks) could also be useful in monitoring animals or other organisms that cannot be easily tracked or retraced once found. This is an interesting junction between technology and physical science, where technology can aide in the advancement of science.

Van de Ven, James, et al. Soft switch lock-release mechanism for a switch-mode ... (n.d.). Retrieved December 12, 2017, from https://www.bing.com/cr?IG=B13A78BE0B9D4962A383CC65A4247473&CID=3116B49CBD316AC70804BFCABC376BAD&rd=1&h=V-qnX91BDGQx7M3gK9L2q5pCsOSUhKwb6Vh2-JA4LXI&v=1&r=https%3a%2f%2fexperts.umn.edu%2fen%2fpublications%2fsoft-switch-lock-release-mechanism-for-a-switch-mode-hydraulic-pu&p=DevEx,5068.1

Reflection: It is very interesting how switch mode hydraulic circuits can be used in place of regular powered circuits, saving money, time and being more efficient. These circuits perform as expected for duty cycles and pressures below the design conditions, which is more than regular circuits can do as well. This will have a large impact on energy usage and natural resource exhaustion in the future, because if we are able to harness all the energy into cheaper and more efficient then we will be able to have more of an abundance of energy to use. Lower losses during valve transition allow the use of slower switching valves, lowering energy consumption, and cost, which will all be beneficial overall in the future.

Yarosh, Lana, et al. "Happiness Inventors":Informing Positive Computing ... (n.d.). Retrieved November 15, 2017, from http://www.bing.com/cr?IG=D0DBC0BB5ACA4C2286FC7B1C76531121&CID=004

EF1B4200F66C12934FA88210967FA&rd=1&h=HPB4vBabHN0mVk4DWnUhXfxlzF3Fn7_EQdEWUhTAQMg&v=1&r=http%3a%2f%2fwww.jmir.org%2farticle%2fviewFile%2fjmir_v19i1e14%2f2&p=DevEx,5042.1

I think it is very interesting how there is an emerging field of technology targeted toward younger people, and that there are tests being done in the area, rather than just giving children the same technology that was made for everyone (such as iPads or mobile telephones). The field of technology that is specific to be able to help the cognitive development and functionality in children is interesting, and not something I had thought would become so prevalent. However, in today's world there is so much being done with technology that it almost seems impossible that there wouldn't be a way to use it to help children's development.

Essay

About 8 of the papers I read took place before I had begun my work on this project in the lab I worked in. These readings encompassed the broad spectrum of computer science and various areas within the subject. This allowed me to gain knowledge in areas I was unfamiliar with and introduced me to several new potential areas of study for the future.

While reading these papers, I learned the process of reading and understanding scientific texts. In the beginning, I often had to pause to take note of concepts I did not understand, which was distracting from the reading; eventually, I became more familiar with much of the subject area and was able to understand more of what I was reading much faster. After reading all the different research papers on different topics relating to computer science, my knowledge of the subject was enhanced greatly. I learned about various topics like robotics, crowd simulation, virtual reality, goniochromatic colors, artificial intelligence, and more. The exposure to all these areas within computer science was very beneficial because, although I may not study all of them, I was able to better understand how interconnected the different disciplines within computer science are, and just how broad the spectrum of the field is. Each paper I initially read took thorough reading to fully comprehend, though I was able to read faster as I got used to reading similar types of texts. Along the way, I also learned about the scientific process and the way research papers are structured. The structure of having an abstract, introduction, experimental design, analysis, discussion, and conclusion was very common and appeared in nearly all the papers I read. Knowing this format helped me predict what I would be reading in each of the sections before I read it.

I interviewed the authors of the research papers I read, since they all work at the University of Minnesota in the Computer Science and Engineering department. As I did this, I formed an interest in the area of artificial intelligence, so I began reading more papers in this area. This is a very large and broad area of study within computer science, and it is also a fairly new topic, so I was able to see several different areas within artificial intelligence that were being researched, such as machine learning, natural language processing, and automated vehicles.

While I was reading about artificial intelligence, one area that I found I enjoyed reading about was the applications of voice activated technology to different cases. Voice technology – most commonly known being Google Home, Amazon Echo, and Siri – is a fairly new and popular topic, and I found it very interesting to see how these types of technology could be improved or modified to fit a specific purpose (in this case, that would be using voice technology as a personal assistant).

As I read about voice technology, I began to form a clearer picture of the area I wanted my project to surround, so I began to read up on the different areas of human-computer interaction, since that is the most important part of the software behind voice activated technology. I realized that natural language processing (NLP) was one of the largest areas within this topic, and that it was also fairly new in that there was a lot to be tested and discovered within it, so I did more research about NLP.

Much of the current research was about semantics and parsing, but I also found that the abilities of Amazon's Alexa software in doing this parsing using NLP was lacking, and I was intrigued about why Alexa was not able to carry on a conversation with users, and I knew I wanted to do more research about this to determine what types of techniques could be used to improve the communication abilities for Alexa, especially given a certain purpose.

After exposing myself to all of this literature, I concluded that my project would focus on some type of voice activated technology (most likely Alexa), and the natural language processing that went along with it. Given how new this area of study is and how many advancements there are yet to be made, I was confident that studying this area could allow me to positively benefit the advancement toward increasing the communication and language processing abilities of voice activated technology.