

# MIE 1412H (2024)

## Human-Automation Interaction

Instructor:

Greg A. Jamieson

Office: RS 306

jamieson@mie.utoronto.ca

Meetings:

Times: Friday 10:00-12:00

January 12<sup>th</sup>-April 12<sup>th</sup>, 2024

Location: UC255

ASSESSMENT:

Reading Quizzes (x2)	30%
Article Review (with a partner)	15%
Individual Assignment	35%
Seminar Participation	20%

Reading List:

Date	Topic	Readings
1/12	Course Introduction	
1/19	Automating Work	Cox, W. C. (1937). An Automatically Controlled Dishwashing Machine. <i>American Journal of Public Health and the Nations Health</i> , 27(9), 865-868. Kelley, C. R. (1968). The role of man in automatic control processes. In C. Kelley, <i>Manual and Automatic Control</i> (pp. 232-254). New York: Wiley. Wiener, E. L., & Curry, R. E. (1980). Flight-deck automation: Promises and problems. <i>Ergonomics</i> , 23(10), 995-1011. Bainbridge, L. (1983). Ironies of automation. <i>Automatica</i> , 19, 775-779.
1/26	Unintended Consequences of Automating Work	Roth, E. M., Bennett, K. B., & Woods, D. D. (1987). Human interaction with an “intelligent” machine. <i>International Journal of Man Machine Studies</i> , 27, 479–526. Parasuraman, R., & Riley, V. (1997). Humans and automation: Use, misuse, disuse, abuse. <i>Human Factors</i> , 39(2), 230-253. Meyer, J., & Bitan, Y. (2002). Why better operators receive worse warnings. <i>Human Factors</i> , 44(3), 343-353.
2/2	Function Allocation (read these in the order listed)	Fitts, P. M., Ed. (1951). <i>Human Engineering for an Effective Air Navigation and Traffic Control System</i> (Chapter 3). Washington: National Research Council. Jordan, N. (1963). Allocation of functions between man and machines in automated systems. <i>Journal of Applied Psychology</i> , 47, 161-165. Fuld, R. B. (1993) The fiction of function allocation. <i>Ergonomics in Design</i> , 1, 20-24. Sheridan, T. B. (2000). Function allocation: algorithm, alchemy or apostasy? <i>International Journal of Human-Computer Studies</i> , 52, 203-216.

Date	Topic	Readings
2/9	Types and Levels of Automation I (read these in the order listed)	<p>Parasuraman, R., Sheridan, T. B., &amp; Wickens, C. D. (2000). A model for types and levels of human interaction with automation. <i>IEEE Transactions on Systems, Man &amp; Cybernetics: Part A: Systems and Humans</i>, 30, 286-297.</p> <p>Onnasch, L., Wickens, C., Li, H., &amp; Manzey, D. (2014). Human performance consequences of stages and levels of automation: An integrated meta-analysis. <i>Human Factors</i>, 56, 476-488.</p> <p>Jamieson, G. A., &amp; Skraaning, G. (2020). The absence of degree of automation trade-offs in complex work settings. <i>Human Factors</i>, 62(4), 516-529.</p>
2/16	Types and Levels of Automation II (read these in the order listed)	<p>Wickens, C. D., Onnasch, L., Sebok, A., &amp; Manzey, D. (2020). Absence of DOA effect but no proper test of the lumberjack effect: A reply to Jamieson and Skraaning (2019). <i>Human Factors</i>, 62(4), 530-534.</p> <p>Jamieson, G. A., &amp; Skraaning, G. (2020). The harder they fall? A response to Wickens et al. (2019) regarding the generalizability of lumberjack predictions to complex work settings. <i>Human Factors</i>, 62(4), 535-539.</p> <p>Skraaning Jr, G., &amp; Jamieson, G. A. (2023). The failure to grasp automation failure. <i>Journal of Cognitive Engineering and Decision Making</i>, 15553434231189375.</p>
2/23	Reading Week	<p>Article for Review assignment:</p> <p>Endsley, M. R. (2024). Understanding Automation Failure. <i>Journal of Cognitive Engineering and Decision Making</i>, <a href="https://doi.org/10.1177/15553434231222059">https://doi.org/10.1177/15553434231222059</a></p>
3/1	Driving Automation (read in order and pay attention to notes)	<p>READING QUIZ 1</p> <p>SAE International (2021). Taxonomy and Definitions for Terms Related to Driving Automation Systems for On-Road Motor Vehicles (SAE J3016, rev. Apr 2021). [Sections 1, 4 &amp; 5 ONLY]</p> <p>Hancock, P. A. et al. (2020). Challenges to human drivers in increasingly automated vehicles. <i>Human Factors</i>, 62(2), 310-328.</p> <p>DeGuzman, C. A. &amp; Donmez, B. (2021). Knowledge and trust in advanced driver assistance systems: A survey of owners and non-owners. <i>Accident Analysis and Prevention</i>, 156, 106121. [Think carefully about what Method and Result details can be skimmed.]</p> <p>Inagaki, T., &amp; Sheridan, T. B. (2019). A critique of the SAE conditional driving automation definition, and analyses of options for improvement. <i>Cognition, Technology &amp; Work</i>, 21, 569-578.</p>
3/8	Automation Transparency	<p>Norman, D. A. (1990). The ‘problem’ with automation: Inappropriate feedback and interaction, not ‘over-automation’. <i>Philosophical Transactions of the Royal Society of London. B, Biological Sciences</i>, 327(1241), 585-593.</p> <p>van de Merwe, K., Mallam, S., &amp; Nazir, S. (2022). Agent transparency, situation awareness, mental workload, and operator performance: A systematic literature review. <i>Human Factors</i>, 00187208221077804.</p> <p>Skraaning, G., &amp; Jamieson, G. A. (2021). Human performance benefits of the automation transparency design principle: Validation and variation. <i>Human Factors</i>, 63(3), 379-401.</p>

Date	Topic	Readings
3/15	Automation as a “Team Player”	<p>Sarter, N. B., &amp; Woods, D. D. (1997). Team play with a powerful and independent agent: Operational experiences and automation surprises on the Airbus A-320. <i>Human Factors</i>, 39, 553-569.</p> <p>Christoffersen, K. &amp; Woods, D. D (2002). How to make automated systems team players. In E. Salas (Ed.), <i>Advances in human performance and cognitive engineering research (vol. 2, pp. 1–12)</i>. Amsterdam: Elsevier.</p> <p>Klien, G., Woods, D. D., Bradshaw, J. M., Hoffman, R. R., &amp; Feltovich, P. J. (2004). Ten challenges for making automation a "team player" in joint human-agent activity. <i>IEEE Intelligent Systems</i>, 19(6), 91-95.</p> <p>Rieth, M., &amp; Hagemann, V. (2022). Automation as an equal team player for humans?—A view into the field and implications for research and practice. <i>Applied Ergonomics</i>, 98, pp??.</p> <p>Shneiderman, B. (2020). Human-centered artificial intelligence: Three fresh ideas. <i>AIS Transactions on Human-Computer Interaction</i>, 12(3), 109-124.</p>
3/22	Trust	<p>Lee, J. D., &amp; See, K. A. (2004). Trust in automation: Designing for appropriate reliance. <i>Human Factors</i>, 46, 50-80. [Think carefully about what sections can be skimmed.]</p> <p>Bolton, M. L. (2022). Trust is not a virtue: Why we should not trust trust. <i>Ergonomics in Design</i>, 10648046221130171.</p> <p>Montague, E. N., Winchester III, W. W., &amp; Kleiner, B. M. (2010). Trust in medical technology by patients and healthcare providers in obstetric work systems. <i>Behaviour &amp; Information technology</i>, 29(5), 541-554.</p>
3/29	Good Friday (no class)	
4/5	Automation in Healthcare	<p>Zayas-Cabán, T., Valdez, R. S., &amp; Samarth, A. (2023). Automation in health care: The need for an ergonomics-based approach. <i>Ergonomics</i>, 66(11), 1768-1781.</p> <p>Babbott, S. et al. (2014). Electronic medical records and physician stress in primary care: results from the MEMO Study. <i>Journal of the American Medical Informatics Association</i>, 21(e1), e100-e106.</p> <p>Stiles-Shields, C., Cummings, C., Montague, E., Plevinsky, J. M., Psihogios, A. M., &amp; Williams, K. D. (2022). A call to action: using and extending human-centered design methodologies to improve mental and behavioral health equity. <i>Frontiers in Digital Health</i>, 4, 848052.</p>
4/12		Reading Quiz 2

Suggested Module Topics and Seed Articles

Topic	Seed Article
Mode Awareness and Error	Sarter, N. & Woods, D. D. (1995). How in the world did we ever get into that mode? Mode error and awareness in supervisory control. <i>Human Factors</i> , 37, 5-19.
Formal Methods of Evaluation	Bolton, M. L., Bass, E. J., & Siminiceaeu, R. I (2013). Using formal verification to evaluate human-automation interaction: A review. <i>IEEE Transactions on Systems, Man &amp; Cybernetics: Systems</i> , 43, 488-503.
Representation Aiding	Guerlain, S., Jamieson, G., Bullemer, P., & Blair, R. (2002). The MPC Elucidator: A case study in the design of representational aids. <i>IEEE Transactions on Systems, Man, and Cybernetics</i> , 32, 25-40.
Assisted Driving, Highly Automated Driving	Merat N. & Lee, J. D. (2012). Preface to the Special section on human factors and automation in vehicles: Designing highly automated vehicles with the driver in mind. <i>Human Factors</i> , 54, 681-686.
Automation as Team Player	Christoffersen, K. & Woods, D. D (2002). How to make automated systems team players. In E. Salas (Ed.), <i>Advances in human performance and cognitive engineering research</i> (vol. 2, pp. 1-12). Amsterdam: Elsevier
Human-Robot Interaction	Goodrich, M. A. & Schultz, A. C. (2007). Human-robot interaction: A survey. <i>Foundations and Trends in Human-Computer Interaction</i> , 1, 203-275.
Culture of Automation	Hodgson, A., Siemieniuch, C. E., & Hubbard, E. M. (2013). Culture and the safety of complex automated sociotechnical systems. <i>IEEE Transactions on Human-Machine Systems</i> , 43, 608-619.
Empirical Methods	Parasuraman, R. & Manzey, D. H. (2010). Complacency and bias in human use of automation: An attentional integration. <i>Human Factors</i> , 52, 381-410.
Automation Failure	Skraaning Jr, G., & Jamieson, G. A. (2023). The Failure to Grasp Automation Failure. <i>Journal of Cognitive Engineering and Decision Making</i> , 15553434231189375.
Supervisory Control	Sheridan, T. B. (2012). Human supervisory control. <i>Handbook of human factors and ergonomics</i> , 990-1015.  Sheridan, T. B. (2021). Human supervisory control of automation. <i>Handbook of Human Factors and Ergonomics</i> , 736-760. [GA] has not reviewed this newer edition.]

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Teleoperation	Draper, J. V. (1995). Teleoperators for advanced manufacturing: Applications and human factors challenges. <i>International Journal of Human Factors in Manufacturing</i> , 5(1), 53-85.
Behavioural Adaptation	J. M. Sullivan, M. J. Flannagan, A. K. Pradhan, and S. Bao, "Literature review of behavioral adaptation to advanced driver assistance systems," AAA Foundation of Traffic Safety, Washington, DC, Tech. Rep., 2016.