ECE 695C, Descriptions of the final project/report

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1. Each student is expected to complete his/her own final project.
2. The subject of the final project/report is very flexible and the students are encouraged to set up an appointment with me and discuss his/her ideas regarding the final project/report.
3. Generally the final projects fall into the following three categories.
   - Combine the inference methods you have learned in this course with your own research topics (or any topics you are interested in). Students are welcome to meet with me weekly and we can discuss how your own research interests may benefit from the techniques of this course. Some examples include:
     – Designing compression components for image/video processing, CDMA or spreading sequence-based watermarking, design turbo channel estimation or inversion for communication systems, turbo timing or frame synchronization, and new network protocols with network coding.

     The final project will be graded mainly based on the weekly interaction with me, and/or on 5-10 page report of the final results.
   - Reproduce the simulation and numerical experiment of the classic coding papers and/or some error correcting codes in the standard. Some example papers include [1, 2, 3, 4, 5, 6], DVB-S2, DVB-T2, 3GPP-LTE standards, etc.

     The final project will be graded based on the 10-page report of the final results and on the oral presentation.
   - Perform paper survey on 2–3 state-of-the-art papers. Some example topics include "improved belief propagation decoding," "finite-length behavior of capacity-achieving codes," "the applications of coding in non-communication areas," "the latest capacity-achieving codes, such as the ARA codes, the polar codes," "Soft decoding of Reed-Solomon codes," etc.

     The final project will be graded based on the 10-page report of the final results and on the oral presentation.
4. The key to the success of your final project is to work closely with me so that I can provide some necessary customized guidance for your individual projects.

References

[1] C. Berrou and A. Glavieux, "Near optimum error correcting coding and decoding: Turbo-codes," *IEEE Trans. Commun.*, vol. 44, no. 10, pp. 1261–1271, Oct. 1996.

[2] S. Chung, G. Forney, Jr., T. Richardson, and R. Urbanke, "On the design of low-density parity-check codes within 0.0045 dB of the Shannon limit," *IEEE Commun. Letters*, vol. 5, no. 2, pp. 58–60, Feb. 2001.

[3] S. Chung, T. Richardson, and R. Urbanke, "Analysis of sum-product decoding of low-density parity-check codes using a Gaussian approximation," *IEEE Trans. Inform. Theory*, vol. 47, no. 2, pp. 657–670, Feb. 2001.

[4] T. Richardson and R. Urbanke, "The capacity of low-density parity-check codes," *IEEE Trans. Inf. Theory*, vol. 47, no. 2, pp. 599–618, February 2001.

[5] ——, "Efficient encoding of low-density parity-check codes," *IEEE Trans. Inform. Theory*, vol. 47, no. 2, pp. 638–656, Feb. 2001.

[6] S. ten Brink, "Convergence behavior of iteratively decoded parallel concatenated codes," *IEEE Trans. Commun.*, vol. 49, no. 10, pp. 1727–1737, Oct. 2001.