Ai²: Artificial Intelligence Meets Artificial Insemination — Can a Non-Technical Student Build a Tool That Analyzes Cattle Data Better Than Spreadsheets and Paper?

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Beef cattle producers collect years of breeding, pregnancy, and calving data, but typically analyze it using spreadsheets and manual review — methods too slow to reveal multi-year trends. It was hypothesized that a student could design and deploy a custom AI-powered web application capable of identifying herd management insights that traditional spreadsheet methods would fail to detect, with top-quartile cows showing significantly higher reproductive efficiency ($p < 0.05$). Eight years of production records (2017–2025) from two beef cow-calf operations were cleaned and imported into a cloud database comprising 8,786 animal records and over 17,800 breeding, ultrasound, and calving entries. A six-component composite scoring system ranked 695 cows on a 0–100 scale. A web application was built using AI-assisted development tools to visualize herd trends, sire performance, and individual cow profiles. A natural-language AI assistant was developed, enabling producers to query their data without technical expertise. The AI assistant matched verified database results on all five verification questions in 2–3 seconds each, compared to 10–45 minutes using spreadsheets. It identified a herd open rate that doubled from 5.5% to 13.3% over five seasons and a 29.7-percentage-point spread in sire conception rates. Welch's t-tests confirmed statistically significant differences ($p < 0.0001$) between top- and bottom-quartile cows across all four metrics tested: AI conception rate, calf survival, calving interval, and birth weight. These findings demonstrate that AI-powered tools can surface actionable cattle management insights inaccessible through traditional methods.

Awards Won:
Association for the Advancement of Artificial Intelligence: AAAI Student Memberships for each finalist that is part of the 1st, 2nd, and 3rd Prize Winning projects and 5 Honorable Mention winning projects (up to 3 students per project) (in-kind award / part of the 1st-3rd prize)