Ryan Jeon

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EDUCATION

- **Iowa State University** — Ames, IA
  Doctor of Philosophy (Ph.D.) in Agricultural Engineering — *June 2020 – December 2022*

- **Iowa State University** — Ames, IA
  Masters in Genetics and Genomics — *August 2018 – June 2020*

- **The Ohio State University** — Columbus, OH
  Bachelor of Science in Bioengineering — *August 2012 – June 2018*

PROGRAMMING SKILLS

- **Programming Languages**: Python (Pandas, OpenCV, Seaborn, Pytorch, matplotlib, scikit-learn, Tensorflow, nltk, etc), R (dplyr, ggplot2, lme4, etc), UNIX commands, Hive, SQL, Tableau, Microsoft Office.

RESEARCH PROJECTS

- **Time Series Analysis of Heat Treated Swine** — Iowa State University
  Graduate Research Assistant — *June 2021 - Present*
  - **Leadership**: Directed and managed a team of undergraduates on bimonthly trips to an off campus swine research site for the setup of pigs and environmental sensors for the collection of environmental time series data.
  - **Time Series Analysis**: Created a polished time series dataset by pre-processing data and imputing missing values. Conducted the method of least-squares on R to statistically determine the impact of hot air temperature on six different body parts of the pig, for three different pig body weight groups, on two different pig housing conditions, over four different periods of time. Determined that rate of heat flow was statistically significant across each body part and pig group.

- **Genetic Indicators for Swine Fitness and Body Condition under Stress** — Iowa State University
  Graduate Research Assistant — *August 2018 - June 2020*
  - **Correlations between Swine Fitness and Genetics**: Implemented statistical techniques on a large immunology dataset to demonstrate that a genetic mutation in swine was significantly associated with higher fitness, body fat percentage, resilience, and health status in pigs.
  - **Heritability of Swine Fitness**: Collaborated with an international team to estimate the heritability of over 100 physiological traits in pigs to determine the genetic correlation between disease traits and immune cell proliferation from a novel mitogen stimulation assay.

- **Computer Vision for Activity Recognition in Swine** — Iowa State University
  Graduate Research Assistant — *June 2021 - Present*
  - **Object Detection and Activity Classification**: Utilized a PyTorch implementation of YOLOv3 to detect piglets (mAP = 0.91). Further classified piglet activity by using K-means on frame data (accuracy score = 0.79).
  - **Neural Networks (CNN) and Deep Architecture in Livestock**: Utilized a Tensorflow implementation of a Resnet34 classification model and a YOLOv5 object detection model to strategize computer vision based solutions for pose estimation. mAP = 0.89 and 0.88 respectively. Determined that body pose can be estimated by training the custom object detection model to identify the coordinates of the boundary box that encloses the pig head, to approximate the direction the pig was facing by determining the side of the pig's boundary box closest to the centroid of the head.
  - **Meta: Augmented Reality in Livestock**: Developing a program to superimpose a segmented pig image onto a rendered pig to estimate body condition and fitness of the animal, from only one side view. This creative solution bypasses many problems associated with traditional computer vision based phenotyping in the livestock industry.

- **Estimating Body Condition and Fitness of Swine using Computer Vision** — Iowa State University
  Graduate Research Assistant — *June 2020 - Present*
  - **Biomechanical Modeling**: Built a computer vision based system on Python using OpenCV to objectively calculate various body measurements of 100 pigs for optimized feature extraction. This method implemented image segmentation, contouring, skeletonizing, Douglas Peucker transformation, and trigonometry.
  - **Optimized Phenotyping**: This algorithm was found to have higher accuracy (0.97), precision (0.99), and objectivity than data collected from manual body measurements, thereby modernizing and optimizing gilt selection practices in the swine industry.

Relevant Coursework:

Data Science Programming, Introduction to Machine Learning, Statistical Algorithms for Computer Vision, Database Management, Software Tools for Big Data Analysis, Statistical Design, Statistical Theory for Researchers (1, 2), Bayesian Data Science.

Technical Projects

- **LivestockCV**: Published an open source Python library (livestockCV) for those new to computer vision, undergraduates, veterinarians or animal scientists who wish to implement computer vision strategies on image and video of livestock animals.
- **Apple Watch Body Fat Percentage Tracker**: Visualization of body fat percent changes over a year, regressed against aggregated monthly averages of cardio using the Apple Watch API on Python. Determined through a correlation matrix that increased cardio was associated with decreased body fat percentage. Further analyzed personal cardiovascular activity recognition over different sports and activities using three machine learning classification algorithms: Naive Bayes, K-means, and Random Forest (accuracy score = 0.79, 0.80, and 0.85, respectively.
- **Web Scraping Indeed.com**: Developed a user defined function to web scrape Indeed.com for specified jobs, locations, and important keywords on Python. Outputs a .csv file of the job title, company name, job description, and the indeed.com job posting URL of the first 200 job entries. The job descriptions were further parsed using NLTK to remove stop words and output a histogram of the top twenty most frequently used words in the job description.
- **Automated Piglet Wellbeing Dashboard**: Designed an automated HVAC control dashboard for regulating ideal piglet temperatures on C++ using a PixyCam sensor and various different environmental sensors to prevent heat stress by holistically regulating the overall condition of the piglet. Increased temperatures and humidity would turn on an AC unit, while decreased temperatures would turn on a central heating pad for the piglets.
- **Automated Fashion Color Palette**: Implemented a sports fashion program on Python that can iterate over 100 different shoes of a shoe type (cleats, running, tennis, etc) from Nike to data mine a color palette of each new shoe. The program will output a frequency plot to show based on the collected data, to qualitatively answer the question, which colors are now in style for the season. The concatenated color palettes were surprisingly different for various shoe types.

Presentation Awards

- **ASABE Student Presentation Competition**: ASABE Annual International Meeting, July 12, 2021
- **First Place (Virtual), Three Minute Thesis**: Iowa State University, December 1st, 2020
- **Elanco Animal Health Travel Fellowship**: North American PRRS Symposium, Chicago, Illinois, November 3, 2019

Professional Organizations

- **Agricultural and Biosystems Engineering Graduate Organization**: Executive Team, Secretary, 2021-2022
- **Animal Breeding and Genetics Graduate Organization**: Member, 2018-2021

Publications

- **Effect of a Genetic Marker for the GBP5 Gene on Resilience to a Polymicrobial Natural Disease Challenge in Pigs**: https://doi.org/10.1016/j.livsci.2021.104399
- **An Introduction to Automated Visual Sensemaking for Animal Production Systems**: hhttps://elibrary.asabe.org/abstract.asp?aid=52179
- **Proliferation of Peripheral Blood Mononuclear Cells From Healthy Piglets After Mitogen Stimulation as Indicators of Disease Resilience**: https://doi.org/10.1093/jas/skab084

Conference Presentations and Professional Seminars

- **Automated Visual Angle Measurements in Gilt Selection**: ASABE Annual International Meeting, July 12, 2021
- **Three Minute Thesis Competition**: Iowa State University, December 1st, 2020
- **Genetic Indicators for Disease Resilience**: Masters Thesis Seminar, Iowa State University, March 13, 2020
- **Effect of Genotype at a Genetic Marker for GBP5 on Resilience to a Polymicrobial Natural Disease Challenge in Pigs**: Plant and Animal Genome (PAG) Conference, San Diego, California, January 11-15, 2020
- **Effect of Genotype at a Genetic Marker for GBP-5 on Resilience to a Polymicrobial Natural Disease Challenge in Pigs**: North American PRRS Symposium, Chicago, Illinois, November 2-3, 2019
- **Effect of Genotype at a GBP-5 Marker on Resilience to a Polymicrobial Natural Disease Challenge in Pigs**: American Society of Animal Science (ASAS) Midwest Section, Omaha, Nebraska, March 11-13, 2019
- **Recyclability of Inedible Plant Biomass**: National Aeronautics and Space Administration (NASA), Kennedy Space Station, Florida, March 14th, 2016