Blackbook ai

PIPE AI - Pipe Defect Detection

About the Customer
Engineering firms, construction companies and local authorities all spend large amounts of time manually reviewing CCTV footage from stormwater drainage, sewerage and wastewater pipelines for obstructions or defects. PIPE AI uses AI to identify defects so that organisations can maintain their infrastructure to the required standards, optimise pipe maintenance schedules and reduce inspection costs while transferring and upskilling their employees to higher value, more fulfilling jobs.

Customer Challenge
Pipe condition management is a critical task required of all water utility companies. Unexpected failures within pipe networks almost always have a negative customer impact (think sewerage leak in public area) and are 10-20x more expensive to fix than preventative action. With that in mind water utilities invest considerable time and money into routine pipe inspections to identify issues (cracks, blockages, root intrusions). This almost always takes the form of one or more experienced company resources watching full length videos of pipe inspections, sometimes 30-50 hours a week.

PIPE AI wanted to benefit from Machine Learning Computer Vision to develop, train and deploy fault detection models which align to the PIPE AI Asset Management Framework to identify and categorise defects found in pipe inspection videos to save time, increase accuracy, and decrease maintenance costs by finding faults sooner.

Achieve Strategic Objectives with AI & ML

Blackbook.ai's Solution
Blackbook.ai worked with PIPE AI to develop an automated data analytics tool to enhance sewer pipe review tasks by identifying defects/faults, analysing defect condition, and storing condition assessment grade. This solution, powered by Machine Learning and Computer Vision with PIPE AI on AWS, involved training of a data analytics tool engine which ingested footage from inside pipes to identify & label defects.

PIPE AI offers an end-to-end solution for pipe condition assessment and informs businesses of predictive failure works and schedules inspections by priority. Its platform automatically assesses CCTV footage to identify cracks and anomalies in sewer or stormwater assets.

The scalable solution can also accomodate increasing data footage from multiple new sources and allows users to train the solution for any new defect identification types, as well as the ability to "accept vs reject" condition assessment grade. Internal user groups can also be notified via email when severe defects are identified.

Reports were generated on a periodic basis for both Structural and Serviceability based on type of defect detected, and insights could be integrated with any other internal MW business platforms.

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Blackbook.ai's Solution (continued)
Key AWS services used in this solution are Amazon S3 File Gateway, Amazon S3 (Standard, Standard Infrequent Access and Glacier Deep Archive) for the storage repository, AWS Fargate for orchestration & data integration services and Amazon EFS for temporary storage. The PIPE AI Portal leverages AWS Fargate for orchestration, alongside an Amazon Aurora relational database.

The inference and training components of the Machine Learning model are completed with Amazon SageMaker. As there is an approval step for each analysis conducted in PIPE AI, the system uses this approval to continually expand the training set. Model performance is continually monitored, and each model file and dataset are versioned in AWS S3, an archived version can be rolled back to if necessary.

Results & Benefits
Blackbook.ai's machine learning analysis solution of the ingested footage captured inside the pipes by PIPE AI allows maintenance teams to identify defects and their severity as per WSAA Standards and best practices.

The project resulted in an automated data analytics tool to enhance sewer pipe review tasks by identifying defects and faults, analysing defect condition, and storing condition assessment grade. Reports are generated by the solution for use in functional and managerial roles to optimise processes and procedures, and inform maintenance schedules.

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About Blackbook.ai:
Blackbook.ai is an AWS Advanced Consulting Partner designing intelligent solutions that unlock the value of our clients' organisations. Blackbook.ai was founded in 2017 to provide local opportunities for local talent and offer an alternative for Australian companies to work with local, hardworking and capable consultants.

With over 150 team members in Brisbane, Sydney and Melbourne, we work with cutting-edge technology to solve business issues for some of the biggest companies in Australia. Our experienced team understands your challenges and is committed to develop the best suitable solutions and deliver premium quality work. Our tailored AI, Automation and Analytics solutions leverage your company's data and drive productivity.

About PIPE AI
PIPE AI was created to automate manual tasks and processes related to asset management in the Engineering and Construction industry. The solution, built by PEAK AI, blends 50 years of engineering excellence with Blackbookai's Automation and AI expertise.