## 1 | Use Case Title: MineCo Crusher Optimization

## 2 | Use Case Overview *(<=100 words) Provide a brief description of the use case and the system that your autonomous AI will improve.*

• MineCo mines precious metals from ore.​

• The first and roughest stage of ore processing is crushing the ore, in this case with a gyratory crusher

• Operators manually control supervisory settings for the gyratory crusher.

• The particle size and hardness entering the crusher and the crusher itself, particularly the condition of the liner, vary with an unknown random distribution.  This makes it very difficult to control the crusher well.

• The objective of this EAP project is to train a brain(s) to provide supervisory control settings for the underground gyratory crushers at the MineCo South site that maximize the throughput of fragmented ore.

## 3 | Use Case Value (<=100 words) Explain the value of improving the performance of this system.

A 5% improvement in throughput generates a predicted ROI of $10M / year at the mine site in question.

## 4 | Current Methods Select and explain the current methods used to control or optimize the system

|  |  |  |
| --- | --- | --- |
|  | Method Check all that apply | Description |
|  | Human Operator / Engineer | **Supervisory Control**: The fixed plant team currently gaps the crushers once every 24 hours. This leads to sub-optimal results and is time intensive. |
|  | Expert System |  |
|  | Control Theory (PID, MPC) | **Low-Level Control**: The advance process control system utilizes both PID and MPC control systems. |
|  | Optimization Techniques |  |
|  | Other |  |

## 5 | Limitations of current methods *Select and explain the limitations of current methods*

|  | **Limitation**  Check all that apply | **Description** |
| --- | --- | --- |
|  | Ability to control well across scenarios / conditions | Human operators find it difficult to manage the changing particle size distribution and the changing hardness distribution of the incoming ore. |
|  | Multiple or changing optimization goals |  |
|  | Human Operator /  Engineer Limitations  May include  · Difficulty managing many variables and dimensions  · Difficulty adapting to changing conditions  · Large performance discrepancy between novice and expert operators  · Inconsistency across expert operators | Difficulty adapting to changing conditions: Human operators find it difficult to manage the changing particle size distribution and the changing hardness distribution of the incoming ore.  Large performance discrepancy between novice and expert operators: Expert operators gain expertise over many years. |
|  | Uncertainty in the measurement of the inputs or the process make it difficult to control or optimize. |  |
|  | Time to develop control or optimization system is prohibitive |  |