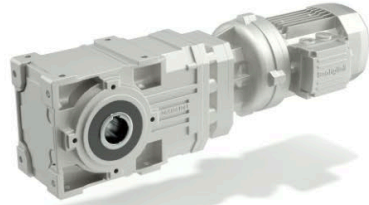


Bonfiglioli Riduttori

17th september 2019 Montreal

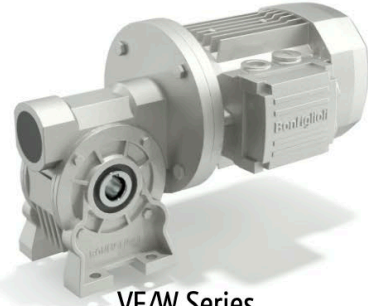
Enrico Andrini
Chief Digital Officer

Bonfiglioli Riduttori (Gearboxes)



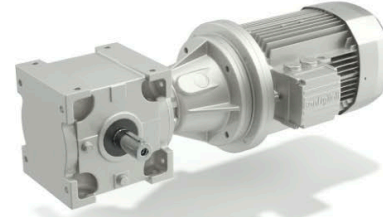
A Series

100 ... 14,000 Nm



VF/W Series

13 ... 7,100 Nm



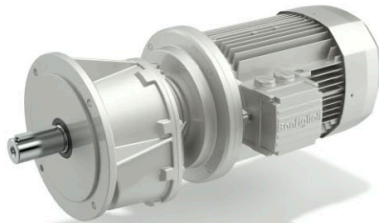
RAN Series

Right Angle Gear Units



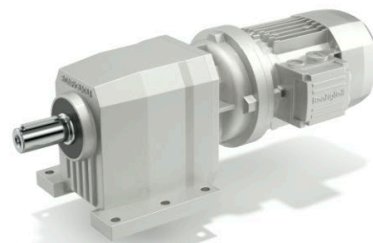
TA Series

150 ... 16,000 Nm



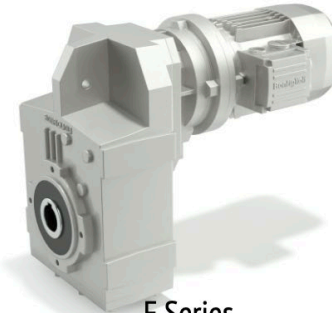
AS Series

50 ... 12,000 Nm



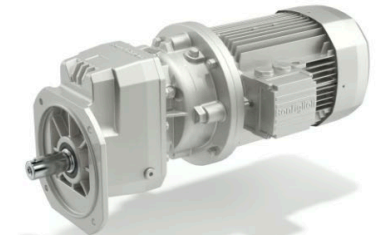
C Series

45 ... 12,000 Nm



F Series

140 ... 14,000 Nm



S Series

21 ... 200 Nm


Bonfiglioli Riduttori




~ 1 Billion Euro turnover

Bonfiglioli Riduttori: markets and applications

- Agriculture & Forestry
- Construction
- Food & Beverage
- Intralogistics
- Logistics
- Marine & Offshore
- Mining
- Packaging
- Wind
- Textile



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Industry 4.0 in Bonfiglioli

Digital Manufacturing

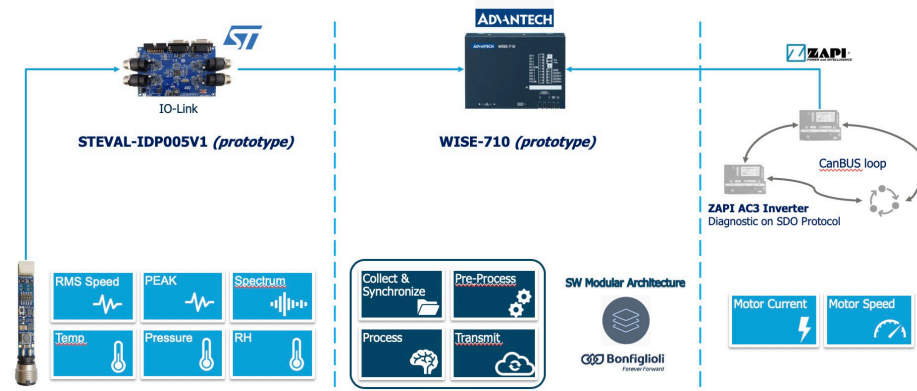
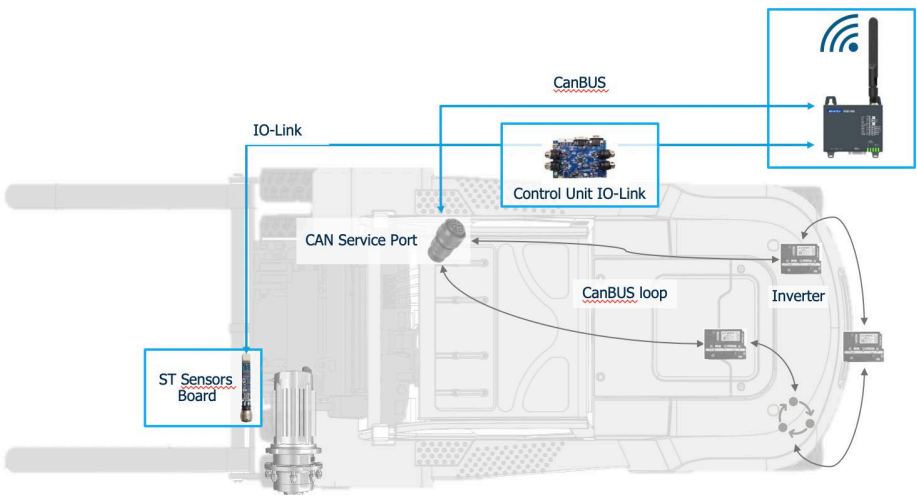


- Macchina presa in esame: Mazak
- Part Program esaminato: 17303206
- Periodo di analisi: 25-05-2018 / 18-07-2018
- N° Campioni: 647.741
- N° Cicli: 169
- ID Ciclo Campione a vuoto: 9013
 - Durata / letture / sample: 29:23 / 3.850 / 5s
- N° Variabili row: 11
- N° Variabili esaminate: 26
- Algoritmi ML utilizzati: RandomForest – Reti Neurali pacchetto R-NeuralNet



Numero Incrementale (che identifica un ciclo)	TimeStamp Lettura variabile	Carico Lineare su Asse X	Posizione Lineare Asse X	Carico Lineare su Asse Y	Posizione Lineare Asse Y	Carico Lineare su Mandrino Z	Posizione Lineare Asse Z	Carico di Rotazione su Asse Z	Numero di Giri Motore Asse Z	Stato Ciclo: 1 - RUN 0 - STOP
CYCLE_NUMBER	EXECUTION_TIMESTAMP_LOCAL	X_LINEAR_LOAD	X_LINEAR_POSITION	Y_LINEAR_LOAD	Y_LINEAR_POSITION	Z_LINEAR_LOAD	Z_LINEAR_POSITION	Z_ROTARY_LOAD	Z_ROTARY_RPM	STATUS
2	2018-05-25 17:11:03.900000	0	929415	-46	379	-3	806614	0	0	1
2	2018-05-25 17:11:08.943000	0	929415	-36	9.64	3	806614	0	0	1
2	2018-05-25 17:11:13.987000	0	929415	-36	9.64	3	806614	0	0	1
2	2018-05-25 17:11:19.330000	0	929415	-41	9.64	3	806614	0	0	1
9013	2018-07-18 17:33:37.643000	-2	0	-45	125	5	164965	0	450	1
9013	2018-07-18 17:33:42.660000	-2	0	-45	125	-5	166	7	1	1
9013	2018-07-18 17:33:47.660000	-2	0	-45	125	-3	1497395	0	450	1
9013	2018-07-18 17:33:52.660000	-2	929415	-41	9.64	-4	724.17	0	0	0

Connected products



The first AI achievement in Bonfiglioli

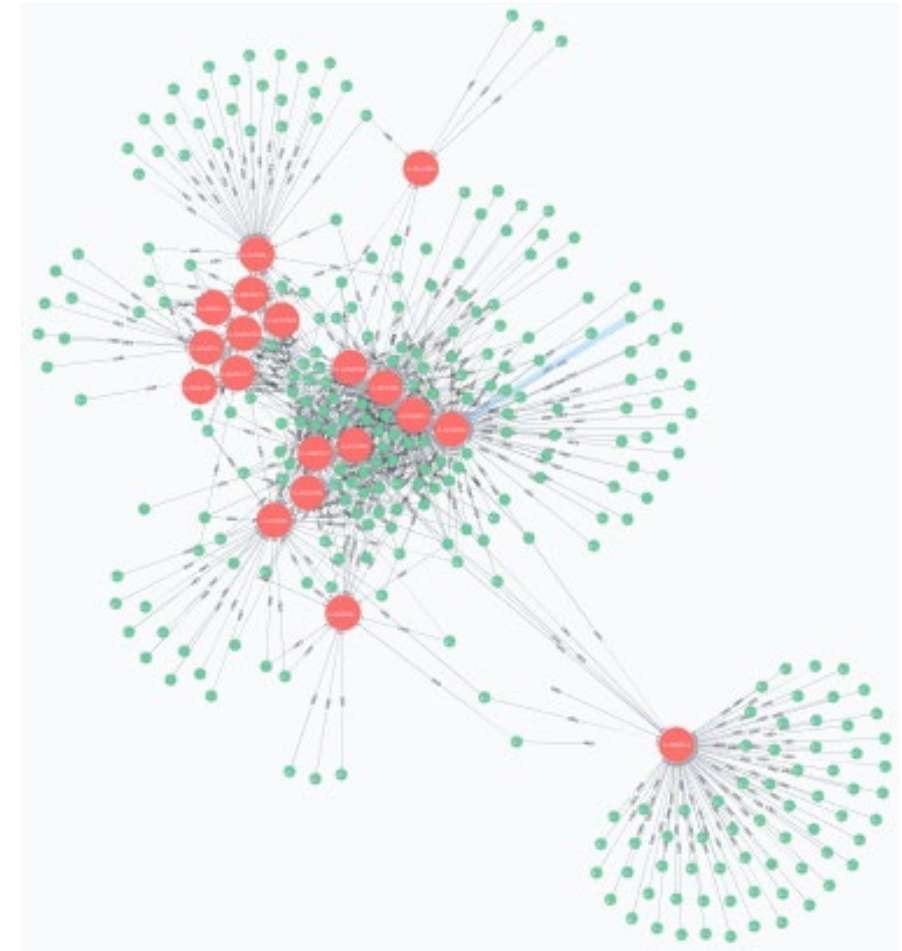
190 millions records of user transaction records

Using unsupervised machine learning techniques, we clustered the users with similar behaviour.

Using the graph model, we identified **communities of users** connected to each other through the transactions they executed: two users are connected if both used the same transaction

(red dots are the users, green dots are the transactions)

Within nearly 2000 users, we identified 142 communities with an **average utilization percentage of 49,5% (from previous percentage of 11%)**



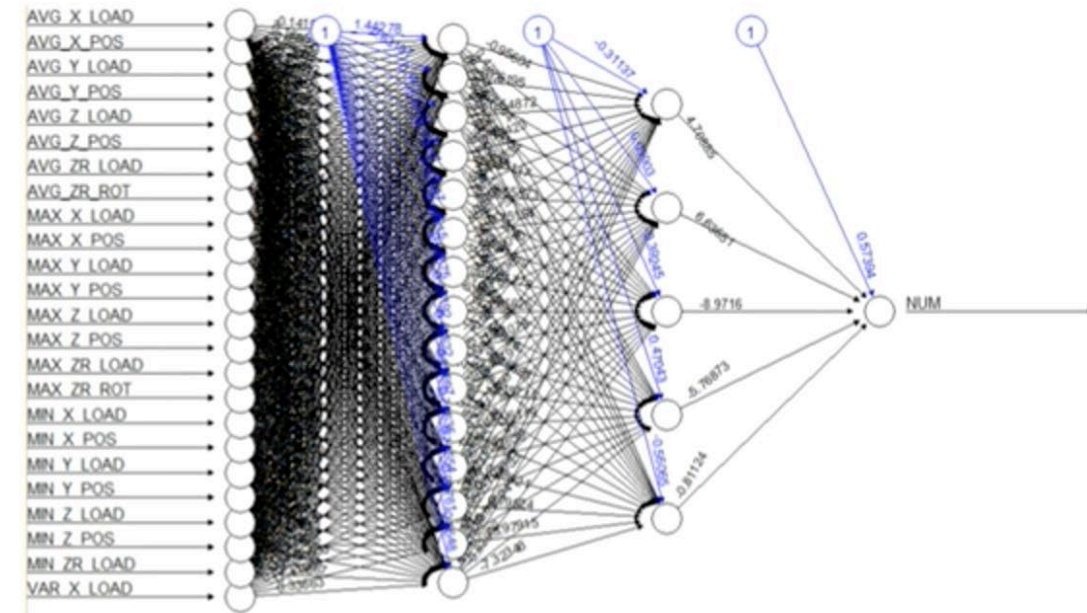
The AI Challenge for Bonfiglioli

Predictive maintenance in our factories

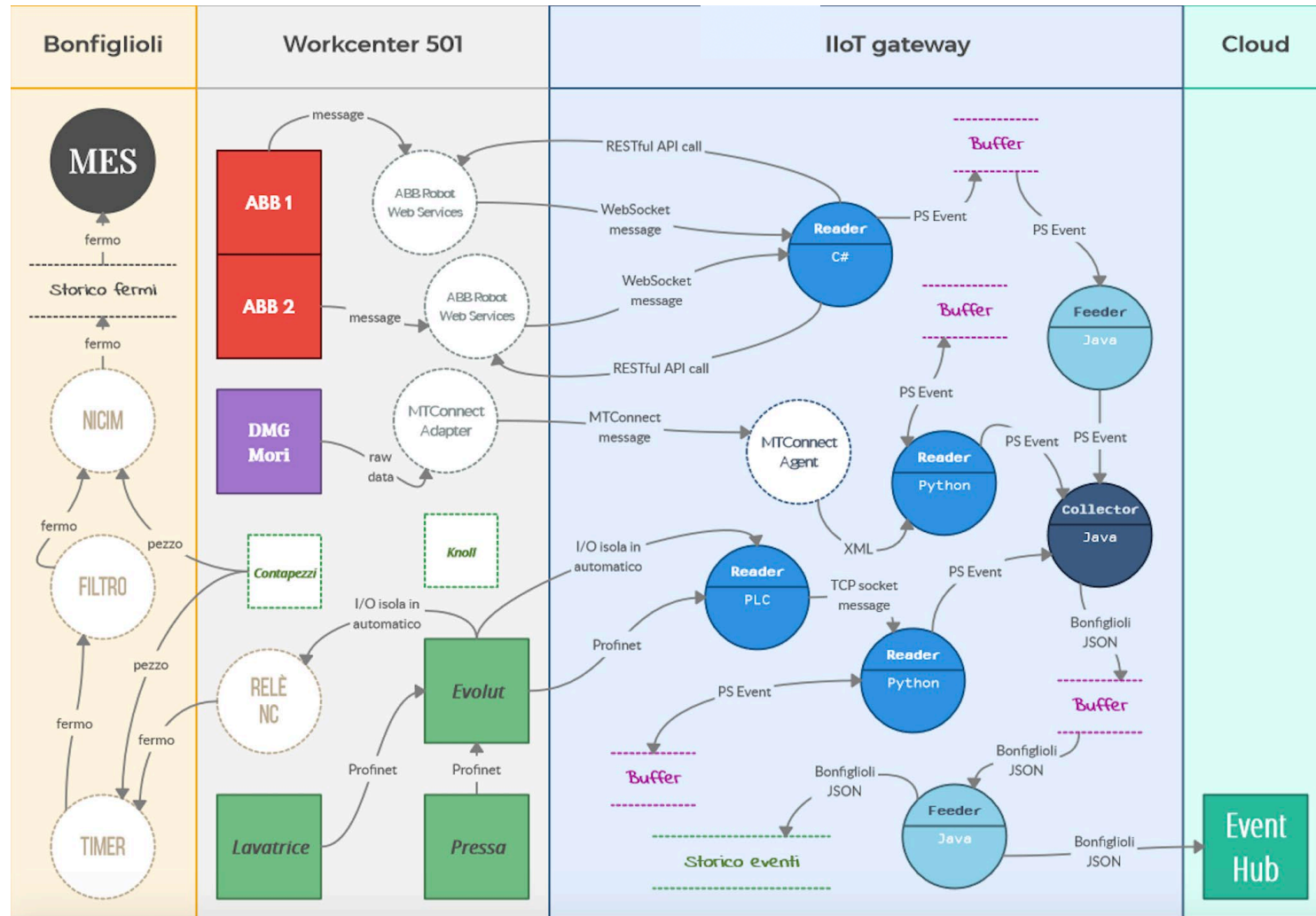
Visual quality inspection

Connected products

Increasing complexity



The current main challenge



*«We can only see a short distance ahead, but
we can see plenty there that needs to be
done»*

Alan Turing

Computing machinery and intelligence (1950)