APCOM 2021
MINERALS INDUSTRY 4.0
The next digital transformation in mining

APCOM

30 AUGUST - 1 SEPTEMBER 2021

FINAL PROGRAMME
TIMES INDICATED ON THE PROGRAMME IS SOUTH AFRICAN STANDARD TIME (SAST)

Day 1 — 30 August 2021

08:30	Zoom Login and Registration
08:30–08:35	Zoom logistics
08:35–08:40	Welcome and Opening Address
	C. Musingwini, *Conference Chairperson, University of the Witwatersrand*
08:40–08:55	Welcome Adddress - SAIMM President
	I.J. Geldenhuys

Session 1: Mine Planning and Design
Session Chair—T.J. Otto, *Anglo American Kumba Iron Ore, South Africa*

08:55–09:30	Keynote Address: FutureSmart Mining™ – How Kumba is re-imaging mining to improve people's lives
	T. Mkhwanazi, *Kumba Iron Ore, South Africa*
09:30–09:50	A genetic algorithm model for optimizing long-term open-pit mine production scheduling
	P.M. Muke[1,2], A.S. Nhleko[2], and C. Musingwini[2], [1]*Institut Supérieur des Techniques Appliquées, Democratic Republic of Congo* and [3]*University of the Witwatersrand, South Africa*
09:50–10:10	Conditions under which an integrated approach to the transition mine problem outperforms a disintegrated approach
	A. Anani[1], H. Li[2], and I.O. Flores[1], [1]*Pontificia Universidad Catolica de Chile, Chile* and [2]*University of Missouri–St. Louis, USA*
10:10–10:30	Smart equipment allocation decisions and updating short-term stochastic production planning in mining complexes through reinforcement learning
	J.P. de Carvalho and R. Dimitrakopoulos, *McGill University, Canada*
10:30–10:45	**Break (15 mins)**

Session 2: Mine Planning and Design
Session Chair—M. Woodhall, *MineRP, South Africa*

10:45–11:05	Short- and medium-term planning of underground mining operations
	O.V. Nagovitsyn, S.V. Lukichev, and V.V. Laptev, *Russian Academy of Science, Russia*
11:05–11:25	A comparison of mining cut definition and scheduling algorithms for open-pit short-term mine planning
	G. Nelis[1] and N. Morales[2], [1]*University of Concepción,* and [2]*University of Chile, Chile*
11:25–11:55	**Lunch (30 mins)**

Session 3: Emerging Technologies
Session Chair—M Woodhall, *MineRP*

11:55–12:30	Keynote Address : Technology adoption in mining
	S. Ntsoelengoe, *CSIR, South Africa*
12:30–12:50	Value-add insights into technology adoption, implementation in mine planning and operational execution at Kumba Iron Ore Mines
	T.J. Otto, G.C. Lindeque, I.D. Ungerer, and T.J. van Heerden, *Anglo American Kumba Iron Ore, South Africa*
12:50–13:10	Semi-autonomous inspection of a belt conveyor in an industrial environment with the use of a legged robot
	P. Stefaniak[1], A. Skoczylas[1], M. Nowicki[2], K. Walas[2], and M. Stachowiak[1], [1]*KGHM Cuprum Research and Development Centre Ltd* and [2]*Poznan University of Technology, Poland*
13:10–13:25	**Break (15 mins)**

Session 4: Emerging Technologies
Session Chair—R. Mitra, *RWTH Aachen University, Germany*

13:25–13:45	Evaluation of the efficiency of smart underground mine evacuation through virtual reality simulations
	S.J. Gaab[1], F.C. Harris[1], S. Duzgun[2], and J. Sattarvand[1], [1]*University of Nevada* and [2]*Colorado School of Mines, USA*
13:45–14:05	Improving geometry dynamic prediction of in-pit stockpiles using geospatial data and polygon models
	M. Balamurali and K.M. Seiler, *University of Sydney, Australia*
14:05–14:25	Development of a new smart evacuation modelling technique for underground mines using mathematical programming
	R.S.H. Meij[1], J. Sattarvand[2], M.S. Shishvan[1], [1]*Delft University of Technology, The Netherlands* and [2]*University of Nevada, USA*
14:25–14:45	Design and manufacturing of a teleoperated excavator platform
	M. Salimov and J. Sattarvand, *University of Nevada, USA*
14:45–15:05	Support vector machine and convolutional neural networks applied to blasthole detection over photogrammetry representations
	J. Valencia, E. Emami, and J .Sattarvand, *The University of Nevada, Reno*
15:05–15:25	**Break (15 mins)**

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Session 5: Mine Planning and Design
Session Chair—A. Mello, *Vuuma, South Africa*

15:25–15:45 OptimalSlope: a software determining optimal pitwall profiles to maximize mine financial returns
S. Utili[1,2], A. Agosti[1,2], and N. Morales[3], [1]*OptimalSlope*, [2]*Newcastle University, United Kingdom* and *University of Chile, Chile*

15:45–16:05 Optimization of pit to SAG Mill network using mixed integer linear programming
N.L. Mai, Z. Saw, and C. Poveda, *Visagio Australia, Australia*

16:05–16:25 A metaheuristic Dual Interchange Algorithm (DIA) for optimizing long-term production scheduling in open-pit mine planning
R.A. Phillips, M.M. Ali, and C. Musingwini, *University of the Witwatersrand, South Africa*

16:25 Day 1 Conference Close

Day 2 — 31 August 2021
08:30 Zoom Login and Registration
08:30–08:35 Zoom logistics
08:35–08:40 Welcome Address
C. Musingwini, *Conference Chairperson, University of the Witwatersrand*

Session 6: Mineral Process and Plant Operations
Session Chair—S. Ntsoelengoe, *CSIR, South Africa*

08:40–09:15 Keynote Address: Experiences with Danie Krige– a co-founder of APCOM
W. Assibey-Bonsu, *Gold Fields, Australia*

09:15–09:35 Material fingerprinting as a potential tool to domain orebody hardness and enhancing the prediction of work index
J.R. van Duijvenbode[1], L.M. Cloete[2], M.S. Shishvan[1], and M.W.N. Buxton[1], [1]*Delft University of Technology, Netherlands* and [2]*AngloGold Ashanti, South Africa*

09:35–09:55 A process mineralogical study to improve beneficiation efficiencies of Dwarsrivier chromite – A digital approach using automated mineralogy
T. Wallmach[1], S. Blancher[1], V. Dieudonné[2], A. Perroton[1], H. Smith[3], and T. Nzima[3], [1]*Eramet Ideas,* [2]*Eramet, France* and [3]*Assore Limited, South Africa*

09:55–10:15 Toward discrete element modelling of material flow in submerged arc furnaces
S.J. Baumgartner[1], Q.G. Reynolds[2,3], C. Bergmann[2], G. Akdogan[3], and C.J. Coetzee[3], [1]*Samancor Chrome,* [2]*Mintek*, and [3]*Stellenbosch University, South Africa*

10:15–10:30 Break (15 mins)

Session 7: Mineral Process and Plant Operations
Session Chair— K. Pratish, *Anglo American, South Africa*

10:30–10:50 Engineering diagnostic features of a vibrating sieving screen's advanced monitoring system in a mineral processing plant
S. Anufriiev, W. Koperska, N. Duda, and P. Stefaniak, *KGHM Cuprum Research and Development Centre Ltd, Poland*

10:50–11:10 Advanced process control for coal flotation: A case study of the approach and benefits of a structured digitalization program
P. Rambalee[1], N. Pillay[1], T. Bohmer[1], L. Auret[2], A. Haasbroek[2], and Z. Horn[2], [1]*Anglo American* and [2]*Stone Three, South Africa*

11:10–11:30 The grouping and segregation error in particular materials
R.C.A. Minnitt, *University of the Witwatersrand, South Africa*

11:30–12:00 Lunch (30 mins)

Session 8: Mine Operations
Session Chair—S. Uludag, *University of Pretoria, South Africa*

12:00–12:35 Keynote Address: Big data and AI in mine safety
S. Duzgun, *Colorado School of Mines Brown, USA*

12:35–12:55 Development of an explosive energy distribution optimization system to accommodate drilling errors by adjusting blasthole charges
S. Klerkx[1], J. Sattarvand[2], M.S. Shishvan[1], [1]*Delft University of Technology, Netherl ands* and [2]*University of Nevada, USA*

12:55–13:15 Haul road mapping from GPS traces
K.M. Seiler, *The University of Sydney, Australia*

13:15–13:35 Automated road damage detection using neural network and maintenance system in an open pit coal mining environment
M.R. Pratama, F.M. Ramadhan, and Sukrisno, *PT Pamapersada Nusantara, Indonesia*

13:55–14:10 Break (15 mins)

Session 9: Mine Operations
Session Chair— P. Leeuw, *University of the Witwatersrand, South Africa*

14:10–14:45 Keynote Address: Building a successful roadmap for digital transformation and industry 4.0
L. Machado, *Visagio, Brazil*

14:45–15:05 Trucks cycle optimization in open pit coal mining using integrated dispatching system data with queue theory adoption
O.A. Putri, S. Andika, and Sukrisno, *PT. Pamapersada Nusantara, Indonesia*

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15:05–15:25	Evaluation of in-pit crushing and conveying systems' productivity in a limestone mine
	D. Wachira and J. Githiria, *Taita Taveta, University, Kenya*
15:25–15:45	Energy efficiency prediction models for air–conditioning systems in underground mining
	N. Duda[1], B. Jachnik[1], P. Stefaniak[1], and P. Śliwiński[2], [1]*KGHM Cuprum Research and Development Centre* and [2]*KGHM Polska Miedź S.A., Poland*
15:45–16:05	Short interval management system improving mining efficiency by optimizing mining processes with real time mining data
	N. Pretorius, G. Krafft, J. Saunders, and T.P. Katakwa, *Cyest IMS, South Africa*
16:05–16:25	Break (15 mins)

Session 10: Mine Planning and Design
Session Chair—E. Jelvez, *Advanced Mining Technology Center, Chile*

16:25–16:45	Genetic algorithm for open pit mine production scheduling optimization problems
	S. Yaw Amponsah, P. Eme, P.M. Takouda, and E. Ben-Awuah, *Laurentian University, Canada*
16:45–17:05	Self-learning infill drilling for strategic mine planning: Simultaneously optimizing the value of additional information in a mining complex under grade uncertainty
	Z. Levinson and R. Dimitrakopoulos, *McGill University, Canada*
17:05–17:25	An approach to haulage network optimization in underground mines
	Z. Shao, S. Li, M. Balci, and M. Kumral, *McGill University, Canada*
17:25–17:45	Optimizing the ramp design in an open pit mine
	I. Kaabachi[1], F. Meunier[1], and N. Morales[2], [1]*Ecole des Ponts et Chaussées ParisTec, France* and *Universidad de Chile, Chile*
17:45–18:05	Adaptive hybrid approach: Combining the lagrangian relaxation approach and the firefly algorithm for the optimization of the long-term open-pit mine production scheduling problem
	K. Tolouei and E. Moosavi, *Islamic Azad University, Iran*
18:05	Day 2 Conference Close

Day 3 — 1 September 2021

08:30	Zoom Login and Registration
08:30–08:35	Zoom logistics
08:35–08:40	Welcome Address
	C. Musingwini, *Conference Chairperson, University of the Witwatersrand*

Session 11: Investment Planning and Project Evaluation
Session Chair—R. Minnitt, *University of the Witwatersrand, South Africa*

08:40–09:15	Keynote Address: Sustainable pit optimization
	E. Topal, *Curtin University, Australia*
09:15–09:35	IT concept design for a mid – size construction company in Poland
	K. Böde[1] and S.F. Böde[2], [1]*CFO HOCHTIEF Polska, Poland* and [2]*RWTH Aachen, Germany*
09:35–09:55	Developing a computational tool for the evaluation of co–and by–product production in mining projects: Case study of chovdar gold – ore – deposit in Azerbaijan
	A. Mammadli[1], G. Barakos[2], Md Ariful Islam, and H. Mischo, [1]*Horizon Education Agency, Azerbaijan* and [2]*Technische Universität Bergakademie Freiberg, Germany*
09:55–10:15	Break (15 mins)

Session 12: Orebody Modelling and Estimation
Session Chair—I. Mabala, *University of the Witwatersrand, South Africa*

10:10–10:30	Mitigating the influence of outliers on kriging estimation
	D. Fourie[1], C. Morgan[1], and R.C.A. Minnitt[2] [1]*Harmony Gold Mining Co. Ltd* and [2]*University of the Witwatersrand, South Africa*
10:30–10:50	Automated probabilistic domain assignment to production blast hole assays
	K. Silversides and A. Melkumyan, *The University of Sydney, Australia*
10:50–11:10	Implicit modelling of geological domains by support vector machine: Tuning the parameters based on consistency of the indicator variogram
	I. Ongarbayev and N. Madani, *Nazarbayev University, Kazakhstan*

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11:10–11:30	**On measuring the spatial sampling density of a deposit for mineral resource classification** M.C. Febvey[1], J. Rivoirard[2], and B. Martin[1], [1]*Geovariances* and [2]*PSL University, France*
11:30–11:50	**Mineral resource modeling of variables with inequality constraints: A case study of an iron ore deposit** S. Abulkhair and N. Madani, *Nazarbayev University, Kazakhstan*
11:50–12:20	**Lunch (30 mins)**

Session 13: Orebody Modelling and Estimation
Session Chair—L. Mai, *Visagio. Australia*

12:20–12:55	**Keynote Address: Closing the trust deficit** A. Lane, *Deloitte, South Africa*
12:55–13:15	**Factors influencing autonomously generated 3D geophysical spatial models** M. Balamurali, A. Melkumyan, and J. Zigman, *University of Sydney, Australia*
13:15–13:35	**3D modelling for mineral resource estimation of the Darreh-Zereshk copper deposit using the indicator kriging approach** Z. Bagheri[1] and E. Moosavi[2], [1]*Isfahan University of Technology* and [2]*Islamic Azad University, Iran*
13:35–13:55	**Spatial clustering as an aid to optimize infill drill holes configuration during exploration campaigns** S. Hmoud and M. Kumral, *McGill University, Canada*
13:55–14:15	**Break (15 mins)**
14:15–14:35	**Conditional bias in resource estimation: A simple guide for practitioners** M.E. Rossi[1] and C. Badenhorst[2], [1]*GeoSystems International, Inc., USA,* and [2]*SIMEC Mining, Australia*

Session 14: Emerging Technologies
Session Chair—J van den Berg, *MinRP, South Africa*

14:35–14:55	**Application of system dynamics principles to surface mining problems** S. Uludağ and L. Pretorius, *University of Pretoria, South Africa*

14:55–15:15	**Tailings Storage Facility (TSF) stability monitoring using CPT data analytics on the example of the Zelazny most facility** N. Duda[1], B. Jachnik[1], P. Stefaniak[1], B. Bursa[2], and P. Stefanek[3], [1]*KGHM Cuprum Research and Development Centre,* [2]*GEOTEKO Serwis Ltd.,*and [3]*KGHM Polska Miedź S.A., Poland*
15:15–15:35	**Big data and the IoT platform architecture design for the mining industry** P. Pyda[1,3], P. Stefaniak[2], H. Dudycz[3], and A. Skoczylas[2], [1]*KGHM Polish Copper S.A. o/COPI* [2]*KGHM Cuprum Research and Development Centre Ltd.* and [3]*Wroclaw University of Economics and Business, Poland*
15:35–15:55	**A deep learning approach for automation of joint sets recognition on 3D point clouds of rock mass surfaces** R. Battulwar, E. Emami, M.Z. Naghadehi, and J. Sattarvand[1], [1]*University of Nevada Reno, USA*
15:55–16:15	**Detection of surface rill erosion on tailings dams using aerial images and deep neural network** F.F. Nasategay, E.E. Gohari, R. Battulwar, M.Z. Naghadehi, and J. Sattarvand, *University of Nevada, USA*
16:15–16:35	**PYRAMP – A platform for resource assessment and mine planning in Jupyter** N. Morales[1,3], E. Jélvez[1,3], G. Morales[1,3], F. Soto[2,3], G. Díaz[2,3], and F. Navarro[2,3], [1]*DELPHOS Mine Planning Laboratory,* [2]*ALGES Geostatistical Laboratory* and [3]*University of Chile, Chile*
16:35–16:40	**Best Student Author Award** W. Assibey-Bonsu, *Gold Fields, Australia*
16:40–16:45	**APCOM 2023 Announcement** W. Assibey-Bonsu, *Gold Fields, Australia*
16:45–16:50	**APCOM 2025 Announcement** *AuSIMM*
16:50	**Conference Close**