Dr. Vassilis Gaganis
Curriculum Vitae

A. Current position

Assist. Professor, in Petroleum Engineering
School of Mining and Metallurgical Engineering, National Technical University of Athens

B. Contact

School of Mining and Metallurgical Engineering, National Technical University of Athens
Athens, Greece, 15773, Phone: (+30) 210 772 2587, email: vgaganis@metal.ntua.gr

C. Education

PhD in Machine Learning in Petroleum Engineering, 2006
Technical University of Crete, Greece, School of Mineral Resources Engineering
Dissertation: Process modeling using sensitivity analysis and artificial neural networks – Application to hydrocarbon phase behavior

MSc in Machine Learning in Petroleum Engineering, 1997
Technical University of Crete, Greece, School of Electrical and Computer Engineering
Dissertation: Development of ANN models to predict PVT and physical properties of reservoir fluids

BSc in Mechanical Engineering, 1995
University of Patra, Greece, School of Mechanical Engineering and Aeronautics
Dissertation: Modal analysis of rotor-bearing systems under seismic excitation

D. Research highlights

1. Pattern recognition and machine learning methods for modeling reservoir engineering problems
2. New computational methods for speeding up the solution of the stability and phase-split problems
3. Machine learning-based models for the downhole prediction of reservoir fluid GOR
4. Neural network-based models for the prediction of reservoir fluids PVT properties
5. Numerical methods for correcting multiphase flowmeter measurements against line conditions
6. EoS modelling of reservoir fluid behavior
7. Artificial intelligence methods for automated treatment of reservoir fluid GC signals

E. Teaching experience

A. Courses list

National Technical University of Athens, School of Mining and Metallurgical Engineering, Undergraduate program.
Courses taught: Reservoir engineering, Drilling engineering, Geothermal energy engineering

Aristotle University of Thessaloniki, Faculty of Sciences, School of Geology, Postgraduate program "Hydrocarbon Exploration and Exploitation".
Courses taught: Reservoir engineering, Drilling engineering

Technical University of Crete, School of Mineral Resources Engineering, Postgraduate program "MSc course in Petroleum Engineering".

Courses taught: Production engineering, Drilling engineering, Introduction to reservoir simulation

International Hellenic University, Postgraduate program "MSc in Oil & Gas technology".
Courses taught: Drilling engineering, Introduction to the IPM software (by Petroleum Experts)

School of Mineral Resources Engineering, Technical University of Crete, Undergraduate program.
Courses taught: Phase behavior, Reservoir engineering, Drilling engineering

B. Crash courses list

University of Stavanger, Stavanger, Norway.
Courses taught: Artificial intelligence applications in reservoir engineering

Sahara Technical Institute, Cairo, Egypt.
Courses taught: Machine learning methods in petroleum engineering

Energean Oil & Gas, Athens, Greece.
Courses taught: EoS modelling using Winprop software

C. Supervision of postgraduate theses

1. 16 MSc theses supervised at the School of Mineral Resources Engineering, Technical University of Crete.
2. 2 MSc theses supervised at School of Geology, Faculty of Sciences, Aristotle University of Thessaloniki.
3. 17 MSc theses supervised at the Department of Oil and Gas Technology, Technical Institute of Eastern Macedonia and Thrace.

D. Supervision of PhD theses

1. Currently supervising two PhD theses at the National Technical University of Athens and one more at the University of Nicosia

F. Professional experience

2020-present *Researcher for the Institute of Petroleum Research (IPR), Foundation for Research and Technology-Hellas (FORTH)*

2017-present *Faculty member at the School of Mining and Metallurgical Engineering, National Technical University of Greece, Athens, Greece*

2016-July *Worked as senior scientist software development engineer at Petroleum Experts Ltd (PetEx), Edinburgh, UK*

2012-2018 *Consultant for Petroleum Experts Ltd (PetEx), Edinburgh, UK*

- Artificial intelligence based phase behavior calculations in reservoir and production simulation
- Fast proxy models for optimizing hydrocarbon production systems

2006-2017 *Senior research scientist in School of Mineral Resources Engineering, Technical University of Crete*

- Application of machine learning methods in reservoir engineering
- Modeling of phase behavior for reservoir simulation and pipeline flow

1997-2014 *Consultant for Schlumberger Fluids Center, Aberdeen, UK and Clamart, Paris, France*

- Modeling of phase behavior for sampling devices
- Multiphase flowmetering

1995-1997 *Research assistant in School of Electronic and Computer Engineering, Technical University of Crete*

- Control of manufacturing systems
- Machine learning

G. Papers in peer reviewed journals

A. Journal papers in "Upstream petroleum engineering"

1. **Gaganis V.**, "Solution of the Rachford Rice equation using perturbation analysis", Fluid Phase Equilibria, paper accepted, 2020.

2. **Gaganis V.**, Marinakis D., Samnioti A., "A soft computing method for the prediction of thermodynamic properties of fluids in flow simulations", Journal of Petroleum Science and Engineering, submitted, under review, 2020.

3. **Gaganis V.**, Homouz D., Maalouf M., Khoury N., Polycrhonopoulou K., "An Efficient Method to Predict Compressibility Factor of Natural Gas Streams", Energies, Vol. 12(13), 2019.

4. **Gaganis V.**, "Simplified discriminating functions for rapid phase stability calculations", Journal of Computers and Chemical Engineering, Vol. 108, 2018.

5. **Gaganis V.**, Kourlianski E., Varotsis N., "An accurate method to generate composite PVT data for black oil simulation", Journal of Petroleum Science and Engineering, Vol. 157, 2017.

6. **Gaganis V.**, Varotsis N., "An integrated approach for rapid phase behavior calculations in compositional modeling", *Journal of Petroleum Science and Engineering*, Vol. 118, pp. 74-87, 2014.

7. **Gaganis V.,** "Reduced flash calculations with temperature dependent binary interaction coefficients", *Fluid Phase Equilibria*, Vol. 354, pp. 166-176, 2013.

8. **Gaganis V.**, Varotsis N., "An improved BIP matrix decomposition for fast reduced flash calculations", *Fluid Phase Equilibria*, Vol. 340, pp. 63-76, 2013.

9. **Gaganis V.**, Marinakis D., Varotsis N., "A general framework of model functions for rapid and robust solution of Rachford-Rice type of equations", *Fluid Phase Equilibria*, Vol. 322-323, pp. 9-18, 2012.

10. **Gaganis V.**, Varotsis N., "Non-iterative phase stability calculations for process simulation using discriminating functions", *Fluid Phase Equilibria*, Vol. 314, pp. 69-77, 2011.

11. Hegeman P., Dong C., Varotsis N., **Gaganis V.**, "Application of artificial neural networks to downhole fluid analysis", *SPE Reservoir Evaluation & Engineering*, Vol. 12, No. 1, pp. 8-13, 2009.

12. Varotsis N., **Gaganis V.**, Nighswander J., "Quality assurance tool for PVT simulator predictions", *SPE Reservoir Evaluation & Engineering*, Vol. 5, No. 6, pp. 499-506, 2002.

B. Journal papers in "Downstream petroleum engineering"

13. **Gaganis V.,** Pasadakis N., "Characterization of oil spills in the environment using parallel factor mutliway analysis", *Analytica Chimica Acta*, Vol. 573-574, pp. 328-332, 2006.

14. Pasadakis N., **Gaganis V.**, Foteinopoulos Ch., "Octane number prediction for gasoline blends", *Fuel Processing Technology*, Vol. 87, pp. 505-509, 2006.

15. Pasadakis N., **Gaganis V.**, Varotsis N., "Accurate determination of aromatic groups in heavy petroleum fractions using HPLC UV-DAD", *Fuel*, Vol. 80, pp. 147-153, 2001.

16. Varotsis N., Pasadakis N., **Gaganis V.**, "A novel approach for the characterization of aromatics in petroleum fractions using HPLC-UV-DAD and Evolving Factor Analysis", *Fuel*, Vol.77, No.13, pp.1495-1502, 1998.

C. Miscellaneous journal papers

17. **Gaganis V.**, Zisimopoulos A., Nikolakopoulos P., Papadopoulos C., "Modal analysis of rotor on piecewise linear journal bearings under seismic excitation", *Journal of Vibration and Acoustics*, Vol. 121, No. 2, pp. 190-196, 1999.

18. Rovithakis G., **Gaganis V.**, Perrakis S., Christodoulou M., "Real-time control of manufacturing cells using dynamic neural networks", *Automatica*, Vol. 35, pp. 139-149, 1999.

19. Rovithakis G., **Gaganis V.**, Perrakis S., Christodoulou M., "Neuro schedulers for flexible manufacturing systems", *Computers in Industry*, Vol. 39, pp. 209-217, 1999.

20. Christodoulou M., **Gaganis V.**, "Neural networks in manufacturing cell design", *Computers in Industry*, Vol. 36, pp. 133-138, 1998.

H. Peer-reviewed papers in conference proceedings

A. Papers in SPE (Society of Petroleum Engineering)/EAGE conferences

1. Stamataki S., Koffa E., Dimitrellou E., **Gaganis V.**, "An integrated CCS approach combining CO2 injection EOR and underground CO2 storage", EAGE GET 2020, Strassburg, France, November 2020.

2. Ismail I., Kazemzadeh Y., **Gaganis V.**, Bassias Y., "Increasing medium-heavy oil recovery in carbonate reservoirs using smart water injection", EAGE Annual conference + exhibition 2020, Amsterdam, The Netherlands, December 2020.

3. Ismail I., Abbaspour M., **Gaganis V.**, Bassias Y., "Increasing oil recovery in naturally-fractured carbonate reservoirs using microemulsions", EAGE Annual conference + exhibition 2020, Amsterdam, The Netherlands, December 2020.

4. **Gaganis V.**, Varotsis N., "Identification of the compositional path followed during reservoir simulation improves the accuracy and accelerates the phase behavior calculations", SPE paper 180124, *SPE Europec*, Vienna, Austria, May 2016.

5. **Gaganis V.**, Varotsis N., "Identification of the compositional path followed during reservoir simulation improves the accuracy and accelerates the phase behavior calculations", SPE paper 180124, *SPE Europec*, Vienna, Austria, May 2016.

6. **Gaganis V.**, Varotsis N., "Machine learning methods to speed up compositional reservoir simulation", SPE paper 154505, *SPE Europec*, Copenhagen, Denmark, June 2012.

7. **Gaganis V.**, Varotsis N., "A new transformation for the rapid solution of the Rachford-Rice equation in phase split calculations", SPE paper 150932, *SPE North Africa Technical Conference and Exhibition*, Cairo, Egypt, February 2012.

8. Hegeman P., Dong C., Varotsis N., **Gaganis V.**, "Application of artificial neural networks to downhole fluid analysis", IPTC paper 11268, *International Petroleum Technology Conference*, Dubai, UAE, December 2007.

9. **Gaganis V.**, Varotsis N., "Monitoring PVT properties ensures physically sound tuned EoS behavior over the entire operating conditions range", SPE paper 94211, *SPE Europec*, Madrid, Spain, June 2005.

10. Varotsis N., **Gaganis V.**, Nighswander J., "Quality assurance tool for PVT simulator predictions", SPE paper 68235, *SPE Middle East Oil Show and Conference*, Al Manama, Bahrain, March 2001.

11. Varotsis N., **Gaganis V.**, Nighswander J., Guieze P., "A novel non-iterative method for the prediction of the PVT behavior of reservoir fluids", SPE paper 56745, *SPE Annual Conference*, Houston, Texas, US, October 1999.

B. Papers in ESAT (European Symposium on Applied Thermodynamics) conferences

12. **Gaganis V.**, Varotsis N., "Rapid and thermodynamically consistent phase behaviour calculations in process simulation", *30th European Symposium on Applied Thermodynamics*, Prague, Czech Republic, June 2018.

13. **Gaganis V.**, Varotsis N., "A simplified thermodynamic approach for reservoir fluid phase behavior mapping with depth", *29th European Symposium on Applied Thermodynamics*, Bucharest, Romania, May 2017.

14. **Gaganis V.**, Varotsis N., "Thermodynamic properties of fluids in the upstream petroleum engineering: from rigorous thermodynamics to soft computing", *29th European Symposium on Applied Thermodynamics*, Bucharest, Romania, May 2017.

15. **Gaganis V.**, Varotsis N., "Rapid multiphase stability calculations in process simulation", *27th European Symposium on Applied Thermodynamics*, Eindhoven, Netherlands, July 2014.

16. **Gaganis V.**, Varotsis N., "Novel approach to the reduced variables method improves phase equilibrium computations accuracy", Poster presentation, *26th European Symposium on Applied Thermodynamics*, Potsdam, Germany, October 2012.

17. **Gaganis V.**, Varotsis N., "The risk of non-physically sound tuned cubic EoS models: Critical appraisal and remedies", *23th European Symposium on Applied Thermodynamics*, Cannes, France, May 2008.

18. **Gaganis V.**, Varotsis N., Birkett G., "Sensitivity controlled neural networks for the prediction of PVT properties exhibit equation of state like behavior", *22th European Symposium on Applied Thermodynamics*, Elsinore, Denmark, June 2006.

19. Varotsis N., **Gaganis V.**, Nighswander J., "An innovative ANN-based thermodynamic petroleum fluids properties model providing quality assured predictions", Poster presentation, *19th European Symposium on Applied Thermodynamics*, Santorini, Greece, September 2002.

C. Other papers in "Upstream petroleum engineering"

20. **Gaganis V.**, Stamataki S., "Production monitoring and control in high enthalpy geothermal fields", 12th National Conference in Renewable Resources, paper accepted and will be presented in Thessaloniki, Greece, 2021.

21. Ismail I., **Gaganis V.,** "Recent developments in modelling hydrates formation and inhibition in offshore gas field production and pipelining systems", East Mediterranean Conference, Nicosia, Cyprus, September 2020

22. Samnioti A., **Gaganis V.**, "Optimizing gas recycling performance to minimize condensate liquid build up by means of machine learning", East Mediterranean Conference, Nicosia, Cyprus, September 2020

23. **Gaganis V.**, Varotsis N., "Is using rigorous thermodynamics for fully compositional reservoir simulation worth the effort?", Surveying Geology & Mining Ecology Management (SGEM), Vienna, Austria, November 2017.

24. **Gaganis V.**, "A fast and robust method for solving the mass-balance equation in phase-split calculations", *4th International Conference on Experiments/Process/System modeling/Simulation/Optimization*, Athens, Greece, July 2011.

25. **Gaganis V.**, Varotsis N., "Sensitivity controlled neural networks for the prediction of thermodynamic properties of fluids", *1st International Conference on Experiments/Process/System modeling/Simulation/ Optimization*, Athens, Greece, July 2005.

D. Papers in "Downstream petroleum engineering"

26. Pasadakis N., **Gaganis V.**, "Characterization of oil spills in the environment using parallel factor multiway analysis", *International Conference on Instrumental Methods of Analysis, Modern Trends & Applications*, Heraklion, Greece, October 2005.

27. **Gaganis V.**, Pasadakis N., "Octane number prediction and optimization for gasoline blends using artificial neural networks", *International Conference on Experiments/Process/System modeling/Simulation/ Optimization*, Athens, Greece, July 2005.

28. **Gaganis V.**, Pasadakis N., Smaragdis P., Varotsis N., "Deconvolution of overlapping HPLC peaks or aromatic hydrocarbons using Independent Components Analysis", *Advances in Chromatography and Electrophoresis-Conferentia Chemometrica*, Budapest, Hungary, October 2003.

29. Pasadakis N., **Gaganis V.**, Smaragdis P., "Independent Components Analysis (ICA) in the deconvolution of overlapping HPLC peaks of oil", *International Conference on Instrumental Methods of Analysis*, Modern Trends & Applications, Thessaloniki, Greece, September 2003.

30. Pasadakis N., **Gaganis V.**, Varotsis N., "An improved method for the separation of aromatics groups in heavy petroleum fractions by HPLC analysis", *International Conference of Instrumental Methods of Analysis – Modern Trends and Applications*, Chalkidiki, Greece, September 1999.

E. Miscellaneous papers

13 more articles on various subjects including: artificial intelligence tools in manufacturing systems identification and control, interpretation of mineral grinding data and rotor-bearing systems analysis

I. Chapters in books

1. **Gaganis V.**, "Perturbation theory and phase behavior calculations using Equations of State models", in *Perturbation Theory*, Hseen Baled (Editor), IntechOpen, 2020.

2. **Gaganis V.**, Zervakis M, Christodoulou M., "Neural Nets and Multichannel Image Processing Applications", in *Neurocomputation in Remote Sensing Data Analysis*, I. Kanellopoulos, G. Wilkinson, F. Roli (Editors), Springer Verlag, 1997.

3. Rovithakis G., **Gaganis V.**, Perrakis S., Kontogiannis V., Christodoulou M., "A Neural Adaptive Control Technique for Manufacturing Cell Scheduling" in *Applications of Neural Adaptive Control Techniques*, Hunt, K. (Ed), World Scientific, 1997.

4. Rovithakis G., **Gaganis V.**, Perrakis S., Christodoulou M., "Discrete Event Complex systems: Scheduling with Neural Networks" in *Dealing with Complexity: a Neural Network Approach*, Warwick K. (Ed), Springer, 1997.

J. Research projects – Consultancy work for the industry

1. "*Sour gas injection EOR performance in the Prinos oil field*", 2018, **Energean Oil & Gas**, Greece.

2. "*Thermodynamic behavior of fluids in EOR project in the Prinos oil field*", 2020, **Energean Oil & Gas**, Greece.

3. "*Machine learning* methods for the *explicit modeling of phase behavior calculations for use in reservoir and production modeling*", 2013. **Petroleum Experts**, Edinburgh, UK.

4. "*Evaluation of phase behavior calculations acceleration by use of machine learning models*", 2011. **Kappa engineering**, Sophia-Antipolis, France.

5. "*Development of an artificial-intelligence based, fully automated, GC-processing software for reservoir fluids*", 2011. **Oilphase division of Schlumberger**, Aberdeen, UK.
6. "*Development of a method to estimate the shrinkage factor range for recovered reservoir fluid samples*", 2011. **Oilphase division of Schlumberger**, Aberdeen, UK.
7. "*Feasibility study on the development of an artificial-intelligence based, fully automated gas chromatography data processing software*", 2008. **Schlumberger Oilfield UK plc**, Aberdeen, UK.
8. *"Gas chromatography round robin project results evaluation"*, 2008. **Schlumberger Oilfield UK plc**, Aberdeen, UK.
9. *"Development of an ANN based algorithm for the prediction of fluid PVT properties at modified line conditions used in conjunction with the Active Sampling Device (ASD)"*, 2007. **Schlumberger Oilfield UK plc**, Aberdeen, UK.
10. "*Development of neural network-based algorithms for the downhole prediction of reservoir fluids GOR*", 2006. **Schlumberger Wireline & Testing**, Sugarland, TX, US.
11. "*Use of pattern recognition methods for speeding up phase behavior calculations in reservoir simulation*", 2005. **Schlumberger SiS**, Abingdon, UK.
12. *"Feasibility study for the development of an EoS emulation tool by using function-learning models to rapidly provide direct PVT values during reservoir simulation"*, 2005. **Schlumberger Oilfield UK plc**, Aberdeen, UK.
13. *"Development of ANN based PVT correlations covering robustly and with enhanced accuracy the MPFM applications for oils and gas condensates at a very wide line conditions range"*, 2004. **Schlumberger Oilfield UK plc**, Aberdeen, UK.
14. "*Sensitivity analysis of measurements uncertainty for the Vx flowmeter*", 2003. **Oilphase division of Schlumberger, Aberdeen**, UK.
15. "*MOREOIL*". Evaluation of the miscible gas injection in oil reservoirs by monitoring the asphaltenes concentration, 2002. **Funded by the E.U.**
16. "*Development of a hybrid ANNs set of models for PVT Expert*", 2002. **Oilphase division of Schlumberger**, Aberdeen, UK.
17. "*Retraining of the PVT Expert tool. Development of the quality assurance tools APE-IN and APE-OUT*", 2001. **Oilphase division of Schlumberger**, Aberdeen, UK.
18. "*Development of the APE-OUT (Accuracy of Prediction Estimator) system and connection to the APE-IN. Retraining of the PVT Expert*", 2000. **Oilphase division of Schlumberger**, Aberdeen, UK.
19. "*Development of a confidence estimator for oils for the PVT Expert tool, compatible to the WFAS system*", 1999. **Oilphase division of Schlumberger**, Aberdeen, UK.
20. "*Feasibility study for the determination of the mud filtrate contamination of reservoir fluid samples*", 1999. **Oilphase division of Schlumberger**, Aberdeen, UK.
21. "*Development of pattern recognition-based tools for the on-site prediction of the properties of a full PVT report with the PVT Express service*", 1996. **Schlumberger Wireline & Testing**, Clamart, France.
22. "*HIMAC, Hierarchical Management and Control in Manufacturing Systems*", 1996. **Funded by the E.U.**

K. Reviewing work for scientific journals

1. Energies, MDPI
2. Electronics, MDPI

3. Computers and Chemical Engineering, Elsevier
4. Fluid Phase Equilibria, Elsevier
5. Simulation Modeling Practice and Theory, Elsevier
6. Chemometrics and Intelligent Laboratory Systems, Elsevier
7. Neural Computing and Applications, Springer
8. International Journal of Environmental Analytical Chemistry, T & F
9. International Journal of Oil, Gas and Coal Technology, Inderscience

L. International patents

1. US patent 7966273, 2011, *Predicting formation fluid property through downhole fluid analysis using artificial neural networks*, by P. Hegeman, C. Dong, C. Woodburn, G. Birkett, N. Varotsis, **V. Gaganis** (Schlumberger Technology Center).

M. Distinctions

1. 1st prize in National Mathematical Olympiad, 1987
2. 1st prize in Local Mathematical Olympiad, 1987, 1988, 1990
3. Ranked 2nd in a class of 180 students, School of Mechanical Engineering and Aeronautics, University of Patras, class of 1995

N. Miscellaneous

H index:	**13** (Google Scholar, as of December 2020)
Citations:	**518** (Google Scholar, as of December 2020)
Member:	Society of Petroleum Engineers, European Association of Geoscientists and Engineers