APACT 22

ADVANCES IN PROCESS ANALYTICS AND CONTROL TECHNOLOGY 2022 CONFERENCE

Celebrating CPACT's 25th anniversary

Programme

Wednesday 14th September - Friday 16th September, 2022

(Welcome reception and pre-conference courses on Tuesday 13th September)

The Crowne Plaza hotel, Chester

CPACT

CENTRE FOR PROCESS ANALYTICS AND CONTROL TECHNOLOGY

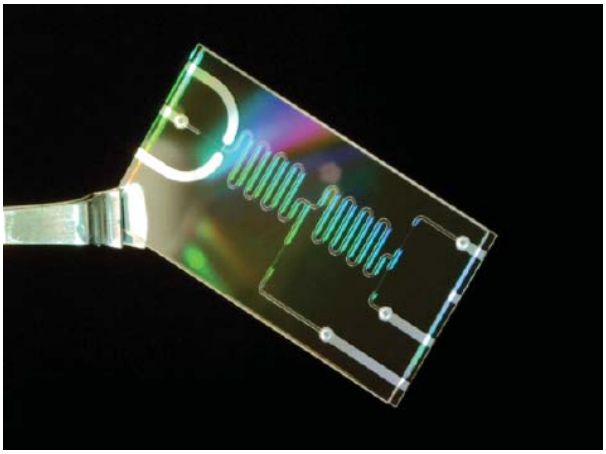
www.cpact.com

APACT is an open forum for the presentation and discussion of recent scientific and engineering advances relevant to process analytics and control technologies. Plenary and keynote speakers will report recent advances in the development and application of novel process analytics, predictive modelling and control technologies, and will review the benefits achieved. We have also incorporated Early Career Researchers into the programme. Following the success of previous conferences, APACT 22 will be a 3 day meeting featuring plenary and parallel sessions on topics crucial to the achievement of manufacturing excellence.

The financial, safety, environmental and sustainability benefits of process analysis and control (PAC) technologies have never been more important to modern manufacturing in the pharmaceuticals, chemicals, materials, petrochemicals, biotechnology, food industries, and many others.

The benefits of in-process measurements, real-time data mining and predictive modelling include:

- Improved process efficiency or conversion
- Reduction of waste products
- Better safety
- Improved fundamental



The conference is aimed at:

- Senior managers, scientists and engineers in the process industries
- Academics specialising in analytical science, control technologies and other related disciplines
- Companies that develop and market process analysis, data analysis and modelling and control technologies

The programme will feature invited and contributed lectures, poster presentations and a vendor exhibition, including the unique APACT Exhibitor Showcase. The meeting is an ideal forum for networking and information gathering on PAC. Those new to process analysis or process control will benefit from the friendly atmosphere that typifies an APACT conference.

Pre-conference Courses - Tuesday 13th September

Three optional half day pre-conference courses will run in parallel on Tuesday 13th September at the Crowne Plaza Hotel. These courses will be open to both conference delegates as a low cost additional option, or may be attended on a 'course only' basis.

(COURSE 1)
NON-LINEAR MACHINE LEARNING FOR CALIBRATION AND CLASSIFICATION

While linear maching learning methods, such as Partial Least Squares (PLS) regression, work in a very wide range of problems of chemical and biological interest, there are times when the relationships between variables are complex and require non-linear modeling methods. Many non-linear machine learning methods have been developed, however, we will focus on a few that we have found quite useful. This includes Locally Weighted Regression (LWR), Artificial Neural Networks (ANNs) and Support Vector Machines (SVMs). ANNs and SVMs for both regression and classification will be considered. The course concludes with a segment on how to choose a method.

Programme

11:45-12:00 Course registration
12:00-13:00 Lunch

13:00-15:00 (1) Introduction
- Why non-linear methods?
- How linear methods deal with non-linear data

(2) Locally Weighted Regression
- Weighted Regression
- Distance Measures
- Basing Models on PCA Scores

(3) Support Vector Machines
- SVM basics, shttering theorm
- Kernel functions
- Classificaiton Models
- Regression Models

15:00-15:20 Tea/coffee break

15:20-17:30 Course continued

(1) Artificial Neural Networks
- ANN stuctures
- Traning procedures
- Avoiding overfitting

(2) Gradient Boosted Decision Trees
- Intro to decision trees
- Classification and Regression Ensemble Models
- XGBoost

(3) Choosing the right method
- Prediction skill
- Computational performance
- Deployment options

This course will be facilitated by Barry Wise, Eigenvector

Pre-conference Courses continued

(COURSE 2)
SCREENING AND OPTIMISATION IN ONE; EXPERIMENTAL EFFICIENCY THROUGH DEFINITIVE SCREENING DESIGNS (DSDS)

This half-day workshop will focus on Definitive Screening Designs (DSD), exploring how these relatively new experimental designs deliver efficiency benefits over more classical, “better-known” designs such as fractional factorials.

Programme

11:45-12:00	Registration
12:00-13:00	Lunch
13:00-15:00	- A background to Design of Experiments (DoE) and its use in industry - Inroduction to statistical software for design and analysis - Overview of the theory behind DSDs
15:00-15:20	Tea/coffee break
15:20-17:30	- A DSD-focused case study - Practice in using statistical software for DSD design and analysis - Workshop summary

This course will be facilitated by Matthew Linsley, University of Newcastle

(COURSE 3)
PROCESS ANALYTICS - USING ADVANCED SENSORS AND DATA ANALYTICS TO DEVELOP RELEVANT AND IMPACTFUL KPIS

Relevant and actionable KPIs are essential to maximise the value of any digitalisation initiative. In this course we will discuss how we can identify and use relevant data and advanced analytics to develop and implement process enhancing KPIs. How to handle different types of data, which data analytical strategies to employ and how to use statistics to establish KPIs are reviewed. It is shown how you can approach your data and relevant tools are suggested. The focus is on applications and relevant theory although mentioned is not reviewed in detail. We will use spectroscopic and process data, multivariate data analytical methods, and visualisation dashboards

Programme

11:45-12:00	Registration
12:00-13:00	Lunch
13:00-15:00	From Process Data to Process Analytics. Traditional sensors, advanced sensors, soft sensors. Different data analytical methods corresponding with KPIs
15:00-15:20	Tea/coffee
15:20-17:30	From identifying relevant KPIs to using KPIs. Identify and prioritise. Combination, visualisation and use. Maintenance of underlying relations and models to ensure relevance and reliability.

This course will be facilitated by Geir Rune Flaten, AspenTech

TUESDAY 13 SEPTEMBER 2022

20:00-21:30 Welcome Reception and Young Researchers Showcase (including refreshments)

WEDNESDAY 14 SEPTEMBER 2022

09:00-10:00	**Registration and Exhibition open**
10:00-10:10	**Welcome and opening of the conference**
10:10-11:00	**Plenary 1** Process Analytical in the food industry: A recipe for success Carol Brigley, Mondelez International
11:00-11:40	**Keynote 1** **Data, models and sensors: the role of real intelligence** Hugh Stitt, Johnson Matthey
11:40-12:20	**Keynote 2** **Sensor enabled automation** Gareth Pierce, University of Strathclyde
12:20-13:20	**Lunch**
13:20-14:30	**Flash Poster Presentations**
14:30-15:00	**Posters (presenters attending), exhibition and tea/coffee**

PARALLEL SESSIONS

	Process Raman spectrometry - Session sponsored by the RSC Molecular Spectroscopy Group	*Machine learning and hybrid modelling*
15:00-15:40	**Keynote 3** **Fit-for-purpose approach for handheld Raman selection for RM identification** Juan Rosas, Organon	**Keynote 4** **Industrial data science - a review of machine learning applications for the chemical and process industries** Max Mowbray, University of Manchester (for Francisco Narvarro-Brull, Solvay SA)
15:40-16:10	**From stargazing to ATEX Raman** Shamus Driver, Tornado	**Faster process development with hybrid modelling and knowledge transfer** Moritz von Stosch, DataHow AG
16:10-16:40	**Online monitoring in upstream bioprocessing by time-gated Raman spectroscopy** Amuthachelvi Daniel, Timegate Instruments Ltd	**Use of data science to support enhanced understanding of pharmaceutical material properties** Ana Patricia Ferreira, Bristol-Myers Squibb
16:40-17:10	**The use of Raman spectroscopy to monitor/control slurry olefin polymerisations in bench-scale reactors** Alexander Standler, Borealis Austria	**Smart sensors in bioprocessing** Kleanthis Mazarakis, Sartorius Data Analytics

17:10-18:10	**Exhibitors' showcase session 1 (inc. refreshments) - Sponsored by SPECAC**
19:00-20:00	**Dinner**
20:00	**Social activity**

THURSDAY 15 SEPTEMBER 2022

09:00-09:50	**Plenary 2** **A reflection of PAT in BMS: An unexpected journey** Gary McGeorge, Bristol-Myers Squibb
09:50-10:30	**Keynote 5** **The application of real time release elements for control strategies related to small and large molecules case studies and implementaiton strategies** Lorenz Liusum, Roche
10:30-11:00	**Tea/Coffee and Exhibition and Posters**

PARALLEL SESSIONS

	Enabling rigorous process measurements	*Enhancing bioprocess optimisation and control*
11:00-11:30	**Validation of inline photometers for improved measurement confidence** Matthew Rice, Kemtrak AB	**Evolution and implementation of PAT at MSD Biotech Dublin** John Geoghegan, MSD Biotech Dublin
11:30-12:00	**Quantifying uncertainty in predictions made with MIR calibration models using a Monte Carlo technique** Liam Wright, Data Science, National Physical Laboratory	**A-TEEM (Absorbance - Transmission Excitation Emission Matrix) - the future of PAT in biopharmaceutical production** Giorgia Marucci, Horiba UK
12:00-12:30	**Fault detection and diagnosis methods towards enhanced process monitoring and control** Joe Emerson, Johnson Matthey	**A hybrid modelling framework for bioprocess** Haiting Wang, Imperial College London

THURSDAY 15 SEPTEMBER 2022 (Cont'd.)

12:30-13:30	**Lunch**
13:30-14:00	**Exhibition and Posters**
14:00-14:40	**Keynote 6** **Final model selection** Barry Wise, Eigenvector
14:40-15:20	**Keynote 7** **New chemometric strategies for heterogeneity assessment and product characterization using hyperspectral imaging** Rodrigo Rocha de Oliveira, Universitat de Barcelona
15:20-16:00	**Tea/Coffee and Exhibition and Posters**

PARALLEL SESSIONS

	Investigating process kinetics	*Nanoparticle process monitoring and control*
16:00-16:30	**Use of quantitative analysis by MIR for kinetic data collection used for chemistry modelling** Morgane Le Hir, Sanofi Chimie	**Optofluidic force induction scheme for real-time monitoring of nanoparticle ensembles** Marko Simic, University of Graz
16:30-17:00	**Automated kinetic rate equation discovery - A methodological framework** Miguel Angel de Carvalho Servia, Imperial College London	**Monitoring of silica particle precipitation by inline photon density wave spectroscopy** Sebastian Zimmermann, University of Potsdam
17:00-17:30	**Determining the mechanism of metal-organic framework formation by non-invasive Raman spectroscopy** Magdalene Chong, University of Strathclyde	**Inline nanosizing and PAT-based process control for precision nanoparticle manufacturing and quality control** Carl Schuurmans, InProcess-LSP

17:30-18:30	**Exhibitors' showcase session 2 (inc. refreshments)**
18:30-19:30	**Free time**
19:30	**Conference dinner (featuring CPACT's 25th anniversary celebrations)**

FRIDAY 16 SEPTEMBER 2022

09:00-09:50	**Plenary 3 - Sponsored by Aspentech** **Structured approaches for data-driven process improvement** Marco Reis, University of Coimbra
09:50-10:30	**Keynote 8** **Circularity and further challenges for the process industry - A PAT perspective** Tobias Eifert, Covestro
10:30-11:00	**Tea/Coffee and Exhibition and Posters**

PARALLEL SESSIONS

	Digital methods for process development	*Advancing applications of process analysis*
11:00-11:30	**Smart process development for small molecule** John Mack, Applied Materials	**Taking an instrument from the "Novel technology" phase to a working, real-world product - a case study** Adam Wilson, Keit Spectrometers
11:30-12:00	**Liquid chromatography digital twin framework** Robert Zuban, Aspen Technology, Inc	**Twin screw wet granulation pharmaceutics formulation platform for process development and mtrological studies** Sofia Matrali, CPI
12:00-12:30	**Digital design of pharmaceuticals: Mechanistic models to predict formulation stability** Jess Andrews, CPI	**Process integration of innovative spectroscopy systems utilizing smart sensor concepts** Christian Lux, tec5 AG

12:30-12:45	**Poster prize presentation (sponsored by Clairet Scientific Ltd.)**
12:45-13:00	**Closing remarks**
13:00-14:00	**Lunch**

Conference Venue

APACT 22 will take place at the Crowne Plaza hotel in Chester. This hotel is situated within the city's historic walls with views over the surrounding areas and the Welsh hills. The hotel has a health and fitness club with pool, gym, sauna and spa.

The Crowne Plaza is close to many of the area's attractions including Chester Zoo, Cheshire Oaks, Blue Planet Aquarium and Liverpool Docks.

Chester is the perfect destination to get away from it all. As well as offering diverse and top-class shopping, entertainment and dining venues, the city is home to many sites of historical importance and also boasts some of the UK's leading tourist attractions.

Chester has a great number of historical references, landmarks and attractions. Founded by the Romans in AD79, Chester still bears signs of its past with its Roman Amphitheatre, historic City Walls and Chester Castle all remaining intact.

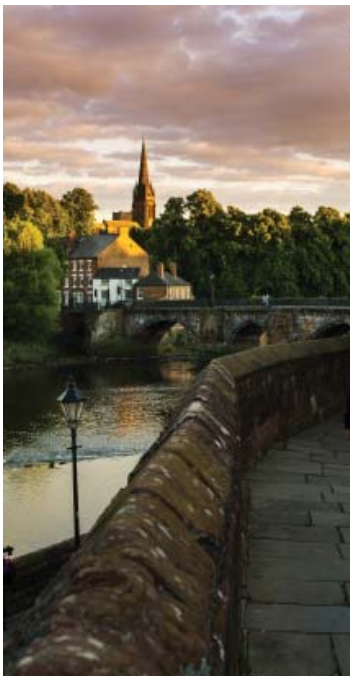
The City Walls give Chester one of its nicknames as The Walled City. The Walls have a rich history having been altered and extended during both the Saxon and Medieval eras.

Travel to the Crowne Plaza Hotel -

Air: Liverpool Airport is 25 miles away and Manchester International Airport is 35 miles away.

Road: Hotel is just minutes from Jct 15 on the M56.

Rail: Chester Station is 1 mile from the hotel. In order to get to Chester you need to change at Crewe. There are inward services to Crewe from London, Scotland, Derby, Birmingham & the West Midlands.



CONFERENCE REGISTRATION FEES

Click here to Register Online - www.apact.co.uk

Conference registration fees include the abstract book, tea/coffee and lunch during the three days of the conference. Welcome reception on Tuesday 13th September, dinner on Wednesday 14th September and a special conference/CPACT 25th anniversary dinner on Thursday 15th September are also included.

Early Bird Registration Deadline is 31st July 2022
CPACT members - £575
Non-members - £750
Student Discounted Registration Fee (student ID will be required) - £250

Registration after 31st July 2022
CPACT members - £725
Non-members - £900
Student Discounted Registration Fee (student ID will be required) - £250

The following pre-conference courses will run in parallel on the afternoon of Tuesday 13th September:

(1) Non-linear Machine Learning for calibration and classification
(2) Screening & optimisation in one; Experimental efficiency through definitive screening designs (DSDS)
(3) Process Analytics - Using advanced sensors and data analytics to develop relevant and impactful KPIS

Pre-conference course registration if attending the conference:
£150

If attending pre-conference course only:
£300

CANCELLATION: Fees are refundable only up to ten weeks before the event. Substitution may be made at any time. If the conference date needs to change due to Covid-19, your registration will automatically be carried forward to the new date.

ACCOMMODATION has been reserved at a special rate of £110 B&B per night at the Crowne Plaza Hotel, Trinity Street, Chester, CH1 2BD Telephone no: +44 (0)1244 899988. Website: www.crowneplaza.com/chester. Accommodation should be booked online when you register at www.apact.co.uk. Only rooms booked by 31st July 2022 will be guaranteed at this rate. After this date, the rate and bedrooms will be subject to availability.

NOT CURRENTLY A CPACT MEMBER? If your organisation is interested in joining CPACT, please visit: www.cpact.com

If you require assistance or futher information, please contact the conference organiser:
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