Ministry of Education and Science of Ukraine

National University of Food Technologies

92^{th}
International scientific conference of young scientist and students

"Youth scientific achievements to the 21st century nutrition problem solution"

April, 20–24 2026

Part 2

Kyiv, NUFT, 2026

Міністерство освіти і науки України

Національний університет харчових технологій

92-а Міжнародна наукова конференція молодих учених, аспірантів і студентів

"Наукові здобутки молоді – вирішенню проблем харчування людства у XXI столітті"

20–24 квітня 2026 р.

Частина 2

Київ НУХТ 2026

92st International scientific conference of young scientist and students "Youth scientific achievement to the 21st century nutrition problem solution", April, 20–204, 2026. Book of abstract. Part 2. NUFT, Kyiv.

The publication contains materials of 91th International scientific conference of young scientists and students "Youth scientific achievements to the 21st century Nutrition problem solution".

It was considered the problems of improving existing and creating new energy and resource saving technologies for food production based on modern physical and chemical methods, the use of unconventional raw materials, modern technological and energy saving equipment, improve of efficiency of the enterprises, and also the students research work results for improve quality training of future professionals of the food industry.

The publication is intended for young scientists and researchers who are engaged in definite problems in the food science and industry.

ISBN 978-966-612-358-2

Матеріали 92-ї Міжнародної наукової конференції молодих учених, аспірантів і студентів "Наукові здобутки молоді – вирішенню проблем харчування людства у XXI столітті", 20–24 квітня 2026 р. – Київ: НУХТ, 2026. – Ч.2. – 499 с.

Видання містить матеріали 91-ї Міжнародної наукової конференції молодих учених, аспірантів і студентів "Наукові здобутки молоді – вирішенню проблем харчування людства у XXI столітті".

Розглянуто проблеми удосконалення існуючих та створення нових енерго- та ресурсоощадних технологій для виробництва харчових продуктів на основі сучасних фізико-хімічних методів, використання нетрадиційної сировини, новітнього технологічного та енергозберігаючого обладнання, підвищення ефективності діяльності підприємств, а також результати науково-дослідних робіт студентів з метою підвищення якості підготовки майбутніх фахівців харчової промисловості.

Розраховано на молодих науковців і дослідників, які займаються означеними проблемами у харчовій науці та промисловості.

ISBN 978-966-612-358-2

The integration of advanced neural network architectures into the sugar evaporation process

Mykhailo Hrama
National University of Food Technologies, Kyiv, Ukraine

Introduction. We've spent decades leaning on basic controllers and old-school physics, but they often trip up when the juice gets thick and the heat starts acting weird. Why are we still sticking to "good enough" when we can actually give the factory a brain? Moving toward modern neural networks isn't just a fancy tech upgrade-it's about finally getting a grip on the chaotic, non-linear mess that happens inside those evaporator vessels.

Materials and methods. Most people associate Transformers with ChatGPT, but their real superpower is tracking patterns over time. In a sugar house, everything is connected-steam pressure, flow rates, vacuum levels. If one thing shifts, it triggers a domino effect an hour later. Instead of just reacting to what happened ten seconds ago, these models can "watch" the whole shift and spot a brix deviation before it even starts. It's like having an operator who has every sensor reading from the last five years memorized and never blinks.

Results and discussion. Then there's the physical reality of the plant. A factory isn't just a list of numbers; it's a physical map. This is where Graph Neural Networks come into play. If you treat each evaporator as a "node" and the pipes as the "links," the AI starts to understand the actual layout of the floor. It stops being a blind calculator and starts respecting the flow of the juice.

Transformer models are already being used in sugar evaporation, and in practice it looks much simpler than it might sound at first. The system watches what's going on — temperature, pressure, how thick the syrup is, how much steam is used — and helps operators keep everything in balance. If something starts drifting even slightly, it can point it out early, before it turns into a real problem.

It also helps deal with everyday variability. Raw materials change all the time, and anyone who has worked with beet juice knows how unpredictable it can be. Instead of constantly readjusting things вручну, the model picks up patterns from previous runs and suggests how to keep the process steady. This makes the work a bit less stressful and more predictable.

Another useful part is how it supports engineers in testing different operating modes. Rather than relying only on past experience, they can look at data-driven suggestions and see what settings worked best in similar situations. In the end, it's just a tool — but a practical one that helps reduce wasted energy, keep product quality stable, and make daily operations run more smoothly.

Conclusion. At the end of the day, this matters because mistakes in a sugar mill are expensive. Anyone who has had to shut down because of tube fouling or unexpected crystallization knows that pain. Using something like an Autoencoder to sniff out "ghosts" in the data can tell you a cleaning cycle is needed long before a human would notice. It saves steam, it cuts the carbon footprint, and it saves a lot of headaches. We're moving toward a setup where the machines don't just follow orders-they actually help us navigate the complexity.