1. Raziskovalna organizacija (*Research organisation)*:

Univerza v Ljubljani, *Fakulteta za strojništvo*

2. Ime in priimek mentorja (*Name and surname of a mentor*):

prof. dr. Marko Nagode

3. Področje znanosti iz šifranta ARRS (*Primary research field*):

2.11.03 Specialna razvojna znanja

4. Kontaktni e-naslov mentorja (*Contact of a mentor)*:

marko.nagode@fs.uni-lj.si

5. Kratek opis programa usposabljanja (*Short description of the program)*:

Programska skupina P2-0182 »Razvojna vrednotenja« (PS) se že vrsto let ukvarja z razvojem algoritma REBMIX za napovedovanje uteži, parametrov in števila komponent mešanih porazdelitev. Mešane porazdelitve se namreč pogosto uporabljajo v procesu modeliranja obremenitvenih stanj in zanesljivosti dinamično obremenjenih strojnih elementov. Nedavno je bil algoritem REBMIX razširjen tudi z možnostjo razvrščanja (clustering) in klasifikacije (classification) podatkov. PS dalje intenzivno dela tudi na področju uporabe nevronskih mrež in drugih algoritmov za potrebe modeliranja dobe trajanja in zanesljivosti dinamično obremenjenih izdelkov. Mladi raziskovalec (MR) se bo najprej posvetil opravljanju štirih izbranih izpitov, ki mu bodo omogočili poglobitev znanj s področij obratovalne trdnosti, statistike ter eksperimentalnih in numeričnih metod. Že v času opravljanja izpitov in pozneje se bo seznanil tudi z znanjem PS s področja rudarjenja s podatki. V nadaljevanju bo primerjal algoritem REBMIX in njegove zmožnosti klasifikacije z drugimi uveljavljenimi algoritmi. Primerjavo bo izvedel na osnovi analize obstoječih baz podatkov. S tega področja bo pripravil prvi seminar, napisal prvi znanstveni članek ter predlagal izboljšave algoritma. V nadaljevanju bo predlagane izboljšave vgradil v programsko kodo ter ponovno analiziral iste baze podatkov, s čimer bo utemeljil prednosti izboljšav. S tega področja bo pripravil drugi seminar in napisal drugi znanstveni članek. Sledila bo aplikacija in validacija izboljšanega algoritma na primeru iz prakse. Industrijski partner v tem trenutku še ni znan, ima pa PS dovolj razvejano mrežo sodelovanja, da bomo zlahka pridobili partnerja, ki ga zanima prenos razvitih znanj in njihova validacija v industrijskem okolju. Pričakujemo, da bo na tej osnovi nastal še tretji znanstveni članek, ki bo imel najboljše možnosti za objavo v reviji z visokim indeksom citiranosti. Mladi raziskovalec bo v omejenem obsegu vključen tudi v pedagoški proces in delo na drugih projektih.

The program group P2-0182 »Development evaluations« (PG) has worked on the development of the REBMIX algorithm for several years. The REBMIX algorithm is used to predict weights, parameters and the number of components of mixed distributions. In the process of modelling load and reliability

of dynamically loaded machine parts, mixed distributions are frequently used. Recently, we have added the possibility of data clustering and classification to the REBMIX algorithm. The PG is continuing to work intensively, also on the application of neural networks and other algorithms for modelling the lifespan and reliability of dynamically loaded parts.

First, the young researcher (YR) candidate will study to pass four exams that will enable him/her to deepen the knowledge of operating strength, statistics, and experimental and numerical methods.

As early as in the exam period as well as later, the YR candidate will be acquiring the PG's knowledge of data mining. He/she will make a comparison based on the analysis of the existing databases. In this field, he/she will write the first seminar, the first scientific paper and suggest the improvements of the algorithm.

Next, he/she will build the suggested improvements into the program code and reanalyse the same databases, thus justifying the advantages of the improvements. In this field, he/she will prepare the second seminar and the second scientific paper.

Then he/she will apply and validate the improved algorithm on a practical example. The industry partner has not been chosen yet. However, the PG's network of cooperation is widespread, so it will be easy to find a partner who will be interested in transferring the newly developed know-how and its validation into their industry environment. Based on this, the YR candidate is expected to write his/her third scientific article, which will have the highest possibilities of all three articles to be published in a journal with a high citation index.

To a lesser extent, the YR candidate will also take part in the pedagogical process and other projects.