



Universidade do Minho

Escola de Engenharia  
Departamento de Produção e Sistemas  
Campus de Gualtar  
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## PhD proposal

### 1 RESEARCH CENTRE

- Algoritmi research centre.
- NSOS (Nonlinear Systems Optimization and Statistics) research group.
- [www.norg.uminho.pt/NSOS](http://www.norg.uminho.pt/NSOS).

### 2 SUPERVISOR

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### 3 TITLE

**Computational tools for semi-infinite programming**

## 4 KEYWORDS

Nonlinear optimization, Semi-infinite programming, software development, C programming language.

## 5 SUMMARY

The works consists in the study of Semi-Infinite Programming (SIP) and development of computational tools. Further developments of the existent software is planned for several platforms (AMPL, GAMS, MATLAB and Python).

## 6 DESCRIPTION

Semi-infinite programming (SIP) problems arise in many engineering areas such as robot trajectory planning, production planning, air pollution control and in Chebyshev approximation theory (see [2] for a survey). The existence of an extension for AMPL [1] that allows the codification of SIP problems (SIPAMPL [3]) helps the development and testing of new solvers. At present, the SIPAMPL package provides over one hundred and sixty coded SIP problems.

The works will consists on the study of SIP in order to improve and extend the SIPAMPL package, allowing it to be used under other platforms with new features.

## 7 SCIENTIFIC BACKGROUND

Knowledge of the C programming language is requested.

No prior knowledge in SIP is necessary, but some background on nonlinear optimization is a plus.

## References

- [1] R. Fourer, D.M. Gay, and B.W. Kernighan. A modeling language for mathematical programming. *Management Science*, 36(5):519–554, 1990.
- [2] R. Hettich and K.O. Kortanek. Semi-infinite programming: Theory, methods, and applications. *SIAM Review*, 35(3):380–429, 1993.
- [3] A.I.F. Vaz, E.M.G.P. Fernandes, and M.P.S.F. Gomes. SIPAMPL: Semi-infinite programming with AMPL. *ACM Transactions on Mathematical Software*, 30(1):47–61, March 2004.