

# Master in Artificial Intelligence

## Advanced Human Language Technologies

Goals

The Task:  
SemEval 2013

Dataset

Course Plan



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# Outline

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# Lab Project Goals

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- Experiment with different AI approaches for a domain-specific NLP task.
- The goal **is not** to build the best possible system, but to understand and compare different NLP paradigms.

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# SemEval-2013 Task 9: DDI Extraction

- SemEval - International Conference on Semantic Evaluation.  
Several tasks or challenges are posed every edition
- SemEval 2013 Task 9: DDIExtraction - Detect drug names and interactions among them described in text.
- Documents - Documents extracted from DrugBank (Drug description leaflets database) and MedLine (abstracts of medical papers)
- Participants - 11 research teams from around the world (1 Cuba, 1 Italy, 1 Finland, 2 Germany, 1 Portugal, 2 Spain, 3 USA)
- Subtasks
  - Drug name recognition and classification (NERC)
  - Drug-Drug interaction recognition and classification (DDI)

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# DDI Extraction Dataset

## DrugBank document example

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```
<document id="DDI-DrugBank.d483">
    <sentence id="DDI-DrugBank.d483.s0" text="Increases in serum creatinine have occurred when CEFOTAN was given alone.">
        <entity id="DDI-DrugBank.d483.s0.e0" charOffset="49-55" type="brand" text="CEFOTAN"/>
    </sentence>
    <sentence id="DDI-DrugBank.d483.s1">
        text="If CEFOTAN and an aminoglycoside are used concomitantly, renal function should be carefully monitored,
            because nephrotoxicity may be potentiated.">
        <entity id="DDI-DrugBank.d483.s1.e0" charOffset="3-9" type="brand" text="CEFOTAN"/>
        <entity id="DDI-DrugBank.d483.s1.e1" charOffset="18-31" type="group" text="aminoglycoside"/>
        <pair id="DDI-DrugBank.d483.s1.p0" el1="DDI-DrugBank.d483.s1.e0" el2="DDI-DrugBank.d483.s1.e1" ddi="true" type="effect"/>
    </sentence>
    (...)
```

<sentence id="DDI-DrugBank.d483.s4">

```
        text="As with other cephalosporins, high concentrations of cefotetan may interfere with measurement of
            serum and urine creatinine levels by Jaffe reaction and produce false increases in the levels
            of creatinine reported.">
        <entity id="DDI-DrugBank.d483.s4.e0" charOffset="14-27" type="group" text="cephalosporins"/>
        <entity id="DDI-DrugBank.d483.s4.e1" charOffset="53-61" type="drug" text="cefotetan"/>
        <pair id="DDI-DrugBank.d483.s4.p0" el1="DDI-DrugBank.d483.s4.e0" el2="DDI-DrugBank.d483.s4.e1" ddi="false"/>
    </sentence>
</document>
```

# DDI Extraction Dataset

## MedLine document example

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```
<document id="DDI-MedLine.d16">
    <sentence id="DDI-MedLine.d16.s0"
        text="Interaction of ketamine and halothane in rats.">
        <entity id="DDI-MedLine.d16.s0.e0" charOffset="15-22" type="drug" text="ketamine"/>
        <entity id="DDI-MedLine.d16.s0.e1" charOffset="28-36" type="drug" text="halothane"/>
        <pair id="DDI-MedLine.d16.s0.p0" el="DDI-MedLine.d16.s0.e0" e2="DDI-MedLine.d16.s0.e1" ddi="true" type="int"/>
    </sentence>
    <sentence id="DDI-MedLine.d16.s1"
        text="The interaction of intramuscularly injected ketamine and its N-demethylated metabolite (metabolite I)
            with halothane was evaluated in rats. ">
        <entity id="DDI-MedLine.d16.s1.e0" charOffset="44-51" type="drug" text="ketamine"/>
        <entity id="DDI-MedLine.d16.s1.e1" charOffset="107-115" type="drug" text="halothane"/>
        <pair id="DDI-MedLine.d16.s1.p0" el="DDI-MedLine.d16.s1.e0" e2="DDI-MedLine.d16.s1.e1" ddi="false"/>
    </sentence>
    (...)

    <sentence id="DDI-MedLine.d16.s5"
        text="The half-life of ketamine in plasma and brain was longer in the presence of halothane than when
            ketamine was given alone. ">
        <entity id="DDI-MedLine.d16.s5.e0" charOffset="17-24" type="drug" text="ketamine"/>
        <entity id="DDI-MedLine.d16.s5.e1" charOffset="76-84" type="drug" text="halothane"/>
        <entity id="DDI-MedLine.d16.s5.e2" charOffset="96-103" type="drug" text="ketamine"/>
        <pair id="DDI-MedLine.d16.s5.p0" el="DDI-MedLine.d16.s5.e0" e2="DDI-MedLine.d16.s5.e1" ddi="true" type="mechanism"/>
        <pair id="DDI-MedLine.d16.s5.p1" el="DDI-MedLine.d16.s5.e0" e2="DDI-MedLine.d16.s5.e2" ddi="false"/>
        <pair id="DDI-MedLine.d16.s5.p2" el="DDI-MedLine.d16.s5.e1" e2="DDI-MedLine.d16.s5.e2" ddi="false"/>
    </sentence>
    (...)

</document>
```

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# Course plan for lab sessions

- Sessions 1-2: Experiment and improve ML-based drug NERC
- Sessions 3-4: Experiment and improve NN-based drug NERC
- Sessions 5-7: Experiment and improve LLM-based drug NERC
- **Deliverable:** Report on NERC
- Sessions 8-9: Experiment and improve ML-based drug DDI
- Session 10: Experiment and improve NN-based drug DDI
- Sessions 11-13: Experiment and improve LLM-based drug DDI
- **Deliverable:** Report on DDI

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# Course plan for lab sessions

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- Lab project must be developed in teams of 2 people
- **Warning:** Lab sessions may not be enough. You'll probably need to work on the assignments at home.