

# Introduction to the Theory and Practice of Argument Analysis

Martín Pereira-Fariña, University of Santiago de Compostela  
Cesar Gonzalez-Perez, Incipit CSIC

## *Abstract*

Argumentation is an essential part of society, both in everyday situations and in academic environments. People argue for defending their standpoints or for criticising viewpoints that they do not share. For these reasons, understanding how arguments are assembled, interpreted and, eventually, evaluated plays a major impact in our lives. However, analysing and understanding arguments is a challenging task, which requires processes of identifying and reconstructing reasoning expressed in natural language.

This tutorial aims to introduce attendees to the roots of the computationally supported analysis of arguments, a field that has been growing quickly over the past few years. It provides the fundamentals of what an argument is, how to identify them in natural language discourse and how they can be analysed by means the IAT/ML theory and the LogosLink software tool. The goal is not to simply identify what people think about a particular topic but to discover why they hold their views.

## Introduction

Argument and debate constitute the cornerstones of civilised society and intellectual life, as it is an essential part of both activities. However, it is also one of the most challenging aspects of the computational analysis of discourse.

This is an introductory tutorial to argument analysis and its computational analysis. Questions such as *What is your main standpoint? What are the reasons that support your claim? Are you disagreeing with my conclusion or with my reasons?* are at the core of argument analysis, and become crucial when we try to unpack the logical and argumentative structure of any particular text.

In this tutorial we will address the fundamentals of argumentation theory, introducing basic concepts in IAT/ML such as Speech Act theory, argumentative vs. non-argumentative text, argumentative discourse units, premise vs. conclusion, or claim vs. evidence. We will also present LogosLink, a software tool that implements some of these ideas and focuses on computational argumentation analysis. Through various group exercises, we will illustrate how real discourse can be analysed in this way.

## Background of the attendees

This is an introductory tutorial, and we will begin with the very basic notions of argumentation. We will introduce all the concepts that are necessary to address argument analysis from the beginning. Therefore, no special background or skills are expected.

However, the tutorial will be more appealing to researchers with an interest in natural language processing techniques in general, and argumentation theory, discourse analysis or even pragmatics.

## Learning objectives

This is a mainly practical tutorial, so the main goal is to acquire the basic skills for argument analysis using LogosLink. Still, some theoretical work is necessary to support practice. We will use only those concepts that are essential for carrying out argument analysis with LogosLink.

In addition to this general learning objective, there are three specific ones:

- Enhancing attendees' skills for recognising and identifying argumentative discourse as well as identifying its basic components.
- Acquiring the fundamentals about argumentation theory and its computational analysis (using concepts in IAT/ML such as argument, premise, conclusion, transition, or illocutionary force)
- Developing basic skills with LogosLink, a software tool specifically developed for this task.

## Contents

The length of this tutorial is 90 minutes. It is structured as follows.

Section	Time (Minutes)	Activities
<b>Introduction</b>	5	Introduction and overview of the contents.
<b>Fundamentals of IAT/ML</b>	15	Introduction to the basic concepts in argumentation theory, differences between argumentative discourse and non-argumentative one, basic components of an argument (premises and conclusion), basic argumentative relations (inference, attack, rephrase).
<b>Familiarisation with LogosLink</b>	5	Overview and basic operation of LogosLink.

<b>Additional theoretical concepts</b>	30	Description of the guidelines for argumentation analysis with IAT/ML, advanced argumentative relations (serial, linked, convergent and divergent), appositions, and other constructs. Everything will be illustrated with examples.
<b>Group exercises</b>	20	Analysis of different text fragments in small groups (2-3 people) to exercise what has been learnt so far.
<b>Discussion</b>	15	General discussion to analyse differences between models, identify mistakes and solve remaining questions.

## Support materials

This tutorial will be fully online. If the conference does not provide a videoconferencing system, we will use Microsoft Teams.

### Prior

Before the tutorial, it is recommended that attendees download and install LogosLink on their computers. The primary download URL is:

<https://verdewek-my.sharepoint.com/:f:/p/cesargon/EjEZVtgByrdCqVQua-dxnzABYAgvZKAaYRWgMUL7cMoTdw?e=gnBoCk>

If this URL does not work, please use the alternative one:

<https://www.dropbox.com/sh/hr5llmwxw4rlvfl/AACpfL0C2m742d0oxYE1rMAra?dl=0>

LogosLink runs on Microsoft Windows, so attendees using other operating systems must use a Windows virtual machine or emulator such as Parallels on MacOS or Wine or VirtualBox on Linux.

### During

The LogosLink software system will be used throughout the tutorial. Attendees should bring their laptops with LogosLink installed, as described above.

Additional materials required for the tutorial will be provided by the organisers: slides with the basic concepts and materials for the exercises.

## Contingency plan

As shown on the conference web site, this tutorial will be carried out entirely online.

## Added value of the tutorial for the attendees

Researchers and practitioners from different fields will benefit from this tutorial, ranging from information systems to teaching and education or design science. The tutorial is highly interdisciplinary, and we expect it to attract an audience from multiple fields that will enrich the interaction between attendees (an important activity during the tutorial).

Major benefits for attendees include:

- Enhancing capabilities and skills for unpacking the deep structure of argumentative discourses and, as a consequence, attaining a better understanding.
- Learning a methodology for discourse analysis based on principles that are reproducible and more objective than using a qualitative and individual analysis.
- Acquiring advanced skills for extracting pragmatic and semantic knowledge from natural language, going further than a pure linguistic analysis.
- Enhancing personal skills for producing a more solid and cogent discourse.

There are additional benefits depending on the attendees' backgrounds:

- For those in information systems or software engineering: A procedure for identifying system requirements from natural language texts based on a detailed analysis of *what* is said and *why* it is said.
- For those in design science: Exploring and assessing the main reasons that are supporting why an artefact is as it is, or prescribing why an artefact should have certain properties.
- For those in conceptual modelling and ontologies: Assessing the relevance of the concepts in the model or candidate concepts based on discursive evidence.
- For those in teaching and education: A framework for evaluating students' understanding and reasoning capabilities about any topic; also, key strategies for building best arguments.
- For those in business process management: A tool for stakeholder opinion analysis based on reasons, i.e., why they argue in favour or against a specific idea.

## Short bio

Martín is Lecturer at the School of Philosophy of the University of Santiago de Compostela (USC). His research interest fields are argumentation theory, philosophy of language and computational models of argumentation; his research goal is to understand the dynamics of how debates run in public sphere about different relevant social issues. Previously, Martín has been a postdoctoral research at Incipit CSIC (2019) and at the Centre for Argument Technology (ARG-tech) of the University of Dundee (2016-2018). He has published more than 30 scientific contributions, both in international and Spanish conferences and journals; he has participated as member of the organised committee of different international conferences,

such as ECAI2020 or COMMA2018. Currently, he is involved in the COST Action APPLY, which is focused on argumentation and public policy analysis.

Cesar is a Staff Scientist at Incipit CSIC, where he leads a co-research line in software engineering and cultural heritage. The ultimate goal of his work is to develop the necessary theories, methodologies and technologies to understand and assist the knowledge creation and communication processes that occur in relation to cultural heritage. Previously, Cesar has worked at a number of public and private organisations in Spain and Australia, both in industry and academia, and in the fields of conceptual modelling, metamodelling and situational method engineering. He is an active member of UNE and ISO, has started three technology-based companies, has been an elected member of the steering committee of the Computer Applications and Quantitative Methods in Archaeology (CAA) association, and has authored or co-authored over 100 publications.

## History of the tutorial

This is the first instance of this tutorial. However, most of its contents have been already presented several times in venues related to Computer Science and Natural Language Processing. It has been usually framed into the field of Argument Mining, a rapidly growing field in the last five years which is attracting a lot of interest. For this tutorial, we will follow the same foundations proposed by Prof. Kasia Budzynska (Warsaw University of Technology, Poland) and Prof. Chris Reed (University of Dundee, UK) about theory of argument structure and Inference Anchoring Theory. Both have delivered the basis of this tutorial several times at ACL2016, IJCAI2016, ELLI2017 and ACL2019, which indicates the relevance and impact of this theory.

For this particular incarnation, we have developed a tutorial that provides a synthesis of the core concepts of IAT and how this theory can be applied using the LogosLink tool, which has not been previously presented.

Martín did a 2-year postdoctoral stay under the supervision of Prof. Chris Reed and Kasia Budzynska in the University of Dundee, so he has advance knowledge about argumentation theory and its computational approaches. He has also experience in the introduction of argumentation theory to beginners, as he was the coordinator of two training courses for annotators during the development of the BBC project (<https://bbc.arg.tech/>).