Presentation of various models of trust used at the HON Foundation

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Overview

- Introduction
- A general Trust model framework proposition
- The HON evaluation model
  - Focus on accreditation model: HONcode
  - Focus on automatic system: Quality criteria detector
- The HON access model
  - HON tools
- The HON educational model
- Conclusion and perspectives
The Health On the Net Foundation’s mission

- To guide Internet users by highlighting reliable, comprehensible, relevant and trustworthy sources of online health and medical information
- HON tackles the major obstacles of Internet usage: the overwhelming quantity of information and the uneven quality of health information available online
With over 10 years of expertise, HON has developed several initiatives to address the problem related to health information quality on the Web.

Two major contributions:

1- HONcode:

2- HON Medical Search Engines:
What are the trust model(s) of HON initiatives?

And so how to organize trust models in general?
A general Trust model framework proposition

**Evaluation Model (kernel of the trust model)**
- Human Evaluation
- Automatic Evaluation

**Access Model (ways to access trust model)**
- Access from Browser (Toolbar, P3P, SSL)
- Access from Search Engine (Google, HONcodeHunt)
- Access from Directory (HONselect, MedlinePlus)
- Access from pro-active system (RSS, PODcast, Newsletter)
- Access from content (seals of quality)
- Access from similar trustworthy content (WRAPIN)
- Access from professionals (during consultation)
- Access for people with special needs

**Educational Model**
- Webmaster education (producer)
- Public education (consumer)
Human evaluation Model

Accreditation Model
- => evaluation made by a third party from a transparent set of rules

Self-regulation Model
- => self-compliance according to a transparent set of rules

Selection Model
- External peer review
- Internal Web selection
- Usage of external selection or accreditation
- Selection by professionals for their patients
Automatic Evaluation Model

- From expert rules
- From human selection with supervised model
- Data driven
  - => e.g. Popularity of sites from page rank paradigm
Educational Model

- **Webmaster education**
  - => How to construct a trustworthy Web site

- **Public education**
  - => awareness about the facts (uneven quality)
  - => teach method to self-verify the quality of information
  - => inform user about useful tools available on Internet
HON in the trust model Framework

Evaluation Model (kernel of the trust model)
- Human Evaluation
- Automatic Evaluation

Access Model (ways to access trust model)
- Access from Browser
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- Access for persons with special needs

Educational Model
- Web master education
- Public education
The HON evaluation model

Accreditation Model
- Based on the 8 HONcode principles & a formal mechanism (voluntary process)

Selection Model
- HON selection
  => Based on same principles but not accredited (unvoluntary process)
- Usage of selection (MedlinePlus, CiSMEF, GHR …)
- Peer review selection (MEDLINE, PMC, UROfrance, Clinicaltrials.gov …)
HONcode of ethical principles

1. Authoritative
   Indicate the qualifications of the authors

2. Complementarity
   Information should support, not replace, the doctor-patient relationship

3. Privacy
   Respect the privacy and confidentiality of personal data submitted to the site by the visitor

4. Attribution
   Cite the source(s) of published information, date and medical and health pages

5. Justifiability
   Site must back up claims relating to benefits and performance

6. Transparency of authorship
   Accessible presentation, identities of editor and webmaster, accurate email contact

7. Transparency of sponsorship
   Identify funding sources

8. Honesty in advertising & editorial policy
   Clearly distinguish advertising from editorial content

http://www.hon.ch/HONcode/
Specificities of HONcode accreditation system

- For medical Web sites
  - => patients, health workers or the general public

- The request for accreditation is free, explicit and voluntary

- Active accreditation
  - => the seal is directly linked to a HONcode certificate located on the HON web site.

- Regular manual and automatic monitoring

- Compliance assurance
  - => Enforce HONcode through a formal complaint system
HONcode accreditation Model

HONcode facts

- + 5,700 sites
- 72 countries
- 32 languages
- 14,000,000 Web pages accredited
- 50% of sites in Europe

HONcode team: 13 persons

- 6 physicians
- 1 pharmacist
- 1 Ph.D. in molecular biology
- 2 law graduates
- 3 medical students

Examples:

- ClinicalTrials.gov
- The National Urban League
- MEDLINEplus.gov
- PubMed
- Stop-tabac.ch
- Hospital 12 de Octubre
- Sociedad Argentina de Pediatría
- Diabetes Netzwerk Deutschland
- alkohol-leitlinie.de
- neuro24.de
- ebm-netzwerk.de
- eurordis.org

Mechanisms of control to improve quality

- Formal complaint mechanism
  => to detect HONcode violation
- Archive of Web pages before review, after review and every month
- Alert System from archive survey
- Cross validation by a pair of reviewers (until consensus)
- Trust cases for HON services (from PIPS)
HON in the trust model Framework

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  - Access from Directory
  - Access from pro-active system
  - Access from content
  - Access from similar trustworthy content
  - Access from professionals
  - Access for disable persons

- **Educational Model**
  - Web master education
  - Public education
<table>
<thead>
<tr>
<th>Quality Criteria Categorizer</th>
<th>h1- authority</th>
<th>h2- complementarity</th>
<th>h3- privacy</th>
<th>h4- reference</th>
<th>h4- date</th>
<th>h5- justifiability</th>
<th>h6- transparency</th>
<th>h7- sponsorship</th>
<th>h8- advertising</th>
<th>other</th>
</tr>
</thead>
<tbody>
<tr>
<td>Text from Web page</td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
</tr>
</tbody>
</table>

Classify any text in one or more related quality criteria categories which are the HONcode principles.
Two main issues for medical information on the Web

- Information overwhelming
- Uneven quality
Part of PIPS (Personalized Information Platform for Life & Health) - a 4 years IST Project.

- **Goal:** The overall objective is to develop and pilot a Health & Life Knowledge and Services Support Environment:
  - Healthcare Professionals in deliverance of personalized and prevention-focused healthcare services compliant with the patient’s personal context of his/her health state, preferences and ambient conditions;
  - The public to make informed decisions concerning treatments and nutrition at any time and place according to the real-time evaluation of his/her state of health.

- **HON Part:** "Trust mechanisms for e-Health Knowledgebase" from "Trust and Security Management" WP3

- **HON developments:**
  - Trusted Search with Privacy functionalities (P3P)
  - Model of trust for PIPS Platform
  - Detector of quality criteria
  - Health trustworthy Question/Answering system
  - Health Literacy categorizer
Automatic detection

Automatic detection of quality of health Web sites

- (Price & Hersh, 1999)
  - Presence of HONcode seal and other criteria
  - No evaluation and no method description
- (Aphinyanaphongs, 2003)
  - Supervised Text categorization method on scientific literature material
- (Griffiths & Al, 2005)
  - Original method, based on IR relevance feedback, on depression domain
- (Wang & Liu, 2006)
  - Detection of code based on regular expressions

Machine learning for text categorization

- Hostile messages (Spertus et al., 1997)
- Spam (Carreras et al., 2001)
- Racist content (Vinot et al., 2003)
Privacy policy

I do not gather any information about you. My site offers unrestricted access to every part; there is no registration (free or otherwise). I put no cookies on your computer, and do not spy on you in any way.

If you ask a question, I reply to the email address you have used. I send one, and only one, email if you ask a question. If you ask for further information, I reply to that, too, once. No unsolicited mail, and I will never sell, distribute, or share your email addresses with anyone.

I collect the questions you ask. That is part of the payback I get for the time invested in the site -- an insight into parents' concerns. For my personal use only.

Thanks for reading my Privacy statement, and for visiting my Website. I hope you will find it useful.

Dr. Parang N. Mehta
N.D. (Pediatrics)
## Size of corpora: number of excerpts

<table>
<thead>
<tr>
<th>Category</th>
<th>English</th>
<th>French</th>
<th>Spanish</th>
<th>Italian</th>
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<tr>
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<td>Privacy</td>
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<td>128</td>
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<td>187</td>
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<tr>
<td>Attribution Ref</td>
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<td>112</td>
<td>71</td>
<td>128</td>
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<tr>
<td>Advertising</td>
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<td>86</td>
<td>142</td>
</tr>
</tbody>
</table>
Features of the method

- Machine learning algorithms (supervised text categorization):
  - SVM, NB, kNN, DT (evaluation of algorithms)

- Learning material:
  - Textual excerpts from accredited web sites
  - URL addresses

- Combination of the two scores: Text & URL

- Linguistic pre-processing: Stemming, Stopwords ...

- Various discrimination features: ngram, cooc, ...

- Unit of classification: Sentence of textual excerpts

- Languages processes: English, French, Spanish & Italian

- Evaluation:
  - 90% learning, 10% test
  - precision, recall, F-measure
**A selection of evaluated methods and features on all classes**

<table>
<thead>
<tr>
<th>Lang</th>
<th>Lem</th>
<th>Meth.</th>
<th>Weight</th>
<th>maR</th>
<th>maP</th>
<th>maF1</th>
<th>miR</th>
<th>miP</th>
<th>miF1</th>
<th>Err</th>
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<td>0.69</td>
<td>0.78</td>
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<td>nnn</td>
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<td>0.67</td>
<td>0.66</td>
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<td>0.72</td>
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<td>0.73</td>
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<tr>
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<td>NB</td>
<td>atc</td>
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<td>0.61</td>
<td>0.77</td>
<td>0.61</td>
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</table>

<table>
<thead>
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<th>Meth.</th>
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<th>maR</th>
<th>maP</th>
<th>maF1</th>
<th>miR</th>
<th>miP</th>
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<th>Err</th>
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<td>0.82</td>
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<td>0.80</td>
<td>0.73</td>
<td>0.06</td>
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<tr>
<td>FRE</td>
<td>w1</td>
<td>NB</td>
<td>nnn</td>
<td>0.80</td>
<td>0.73</td>
<td>0.75</td>
<td>0.80</td>
<td>0.63</td>
<td>0.70</td>
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<tr>
<td>FRE</td>
<td>w1</td>
<td>DT</td>
<td>nnn</td>
<td>0.70</td>
<td>0.77</td>
<td>0.73</td>
<td>0.64</td>
<td>0.73</td>
<td>0.68</td>
<td>0.07</td>
</tr>
</tbody>
</table>
### Precision/Recall contingency (SVM ENG W1)

<table>
<thead>
<tr>
<th>Ass / Cor</th>
<th>Authority</th>
<th>Complementarity</th>
<th>Privacy</th>
<th>Reference</th>
<th>Justifiability</th>
<th>Transparency</th>
<th>Sponsorship</th>
<th>Advertising</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Authority</td>
<td>64 / 72</td>
<td>05 / 05</td>
<td>01 / 01</td>
<td>19 / 34</td>
<td>01 / 09</td>
<td>04 / 13</td>
<td>04 / 09</td>
<td>01 / 01</td>
<td>00 / 01</td>
</tr>
<tr>
<td>Complementarity</td>
<td>05 / 05</td>
<td><strong>80 / 82</strong></td>
<td>05 / 03</td>
<td>01 / 02</td>
<td>06 / 44</td>
<td>00 / 00</td>
<td>03 / 05</td>
<td>00 / 01</td>
<td>00 / 00</td>
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<tr>
<td>Privacy</td>
<td>02 / 03</td>
<td>02 / 04</td>
<td><strong>92 / 90</strong></td>
<td>00 / 01</td>
<td>00 / 03</td>
<td>01 / 02</td>
<td>01 / 02</td>
<td>02 / 06</td>
<td>00 / 00</td>
</tr>
<tr>
<td>Reference</td>
<td>24 / 13</td>
<td>03 / 02</td>
<td>03 / 01</td>
<td><strong>64 / 57</strong></td>
<td>02 / 08</td>
<td>01 / 01</td>
<td>02 / 02</td>
<td>00 / 00</td>
<td>01 / 02</td>
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<tr>
<td>Justifiability</td>
<td>06 / 01</td>
<td>32 / 03</td>
<td>06 / 00</td>
<td>06 / 01</td>
<td>45 / 33</td>
<td>02 / 01</td>
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<td>Transparency</td>
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<td>02 / 02</td>
<td><strong>69 / 69</strong></td>
<td>16 / 17</td>
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<tr>
<td>Advertising</td>
<td>01 / 01</td>
<td>02 / 01</td>
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<td>00 / 00</td>
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<td>00 / 00</td>
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<tr>
<td>Date</td>
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<td>01 / 00</td>
<td>01 / 00</td>
<td>06 / 03</td>
<td>00 / 00</td>
<td>00 / 00</td>
<td>01 / 01</td>
<td>01 / 01</td>
<td><strong>90 / 98</strong></td>
</tr>
</tbody>
</table>

- Globally results are very good for **Privacy** and **Attribution_ref**
- Results are good for **Complementarity, Transparency, Sponsorship** and **Advertising**
- Small confusions between **Sponsorship** and **Advertising**
- Small confusions between **Authority** and **Reference**
- Confusions between **Justifiability** and **Complementarity**
Results summary

- SVM gives better results for precision
- Classical tf-idf Weighting is better (raw frequency nnn)
- Stemming has no effect (to verify for other languages)
- Usage of selected stop-words improve results
- About principles:
  - Privacy, Attribution_date are very well recognized
  - Authority, Complementarity, Privacy, Transparency, Sponsorship and Advertising have good results
  - Attribution_ref and Justifiability have bad results
- French, Spanish and Italian have promising results
- Introduction of a medical general class is efficient
Conclusions

- Supervised categorization
- Categorization into nine classes
- Independent from a specific medical domain and language
- Learning database is continuously updated by specialists
- Suitability for assisting accreditation and revision process
  - Approach will soon be integrated in review process
- Integration and Relevancy in search engine should be evaluated
  - A prototype of Search Engine already exists (with quality filter facilities)
- Main difficulty is due to the difference between the discrimination unit level (sentences) and the final classification level (page or site)
- Improvement of Justifiability through the use of MEDLINE references
- Merge with a classical global approach based on a collection of bad and good pages
HON access models

HON in the trust model Framework

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- Access for persons with special needs

Educational Model
- Web master education
- Public education
The HON ways towards a trustworthy medical information

Content
- Assess the transparency by visualizing HONcode seal directly on Web site and by accessing the remote HONcode certificate

Browser
- HONcode Toolbar and bookmarklet, to assess HONcode compliancy and access to HON SE within the Web browser

Search Engines
- Medhunt: Medical SE (selected by HON expert)
- HONcodeHunt: Search among accredited Web sites (via Google CSE)
- WRAPIN: SE within Medical Trustworthy sources
- PIPS trusted Search (prototype)

Trustworthy similar content validator (WRAPIN)

Directories
- HONselect: A multilingual MeSH oriented directory (English, French, German, Spanish, Portuguese, Italian & Dutch)

Pro-active systems
- News information from conferences in RSS and in audio format (with TTS)
HON access from content (1/3)

A dynamic, unique and dated seal linked to the certificate
After revision by the HON team the website status shows **compliance** with the HONcode.
New generation of HONcode seal

Ways of fighting against the misuse of the HONcode:

Different warning levels

HON automatically displays the HONcode seal and shows its validity in real time
Access from browser

- **P3P**: To manage confidentiality & privacy
- **HTTPS & SSL**: To manage identification & confidentiality (used for registration and certificate)
- **Toolbar**: HONcode compliance & Trustworthy SE (HONcodehunt)

**Bookmarklet**

Wrapin to search or to validate with similar content from trustworthy sources
P3P Model

P3P (Platform for Privacy Preferences) is a W3C protocol for privacy and confidentiality between Web site and Web browser.

P3P is already integrated in standard Web browsers.

Significant limitations:

- Too complicated for webmaster
- => In PIPS we have tried to use P3P without its complexity
A P3P policy is automatically created for all HONcode accredited sites (>5000).

All the dynamic information is related to the DB from HON review process.

3 parts of the P3P policy are dynamic: Entity, Dispute & Statement.

3 different statements are available for the moment: Log, Cookies & Purchase.

2 P3P default schema have been created from these statements for 8 types of sites: Commercial, Governmental, Individual, Non-profit, Organization, Educational, Network & Military.

The Dispute links to the HONcode certificate.
Global search engine: working with Google
The most active partner

HON access from SE (3/4)

=> A better way to reach the public via the most used SE
Medicines To Prevent Asthma Attacks

... medicines need to be taken even when there are no obvious symptoms. They are particularly helpful in preventing asthma attacks due to allergies, exercise, cold air, and some air pollutants. By reducing the swelling and mucus... Children Last updated September 2004 Page 7 of 18. Other helpful websites: Medicines To Prevent Asthma Attacks. Medicines are taken daily, whether or not symptoms occur, to prevent attacks. The goal of these medications is to reduce the inflammation...

www.yourmedicalsource.com/library/astmachild/ASC....

AAA - Patients Consumers Center: Tips to Remember Prevention of Allergies and Asthma in Children

... current information and can match this current information with the needs of your family. Other considerations in preventing asthma. Maternal smoking during pregnancy is associated with increased wheezing during infancy. Exposing children to secondhand smoke in... children. This pamphlet describes steps that may be taken to delay or possibly, prevent the onset of allergies and asthma in children. Preventing food allergies in children can cause a variety of problems that...

www.aaaai.org/patients/publicedmat/tips/prevention...

AAA - Patients Consumers Center: Seniors and Asthma

... Some of those can't be prevented, but at least you can take a flu shot every fall. Being aware of your asthma triggers can help control your asthma. Your doctor can help you explore.... is a practicing allergist in Los Alamos, NM, and a Fellow of the American Academy of Allergy, Asthma and Immunology (AAA)....

www.aaaai.org/patients/seniorsandasthma asthma tri...

Automatic Detected Trust Criteria: Auth Priva
Eating Disorders

**Definition:** A group of disorders characterized by physiological and psychological disturbances in appetite or food intake.

**Synonym(s):** Appetite Disorders / Appetite Disorder / Eating Disorder /

**Narrow term(s):**
- Anorexia
- Anorexia Nervosa
- Bulimia
- Cophrophagia
- Hyperphagia
- Pica

**See also:**
- Obesity
- Thinness


Browse - New search
WRAPIN to validate content by comparing with similar trustworthy content
Wrapin: Your search Tool to verify medical information - Mozilla Firefox

WRAPIN bookmarklet

Query: http://www.discount-vitamins-herbs.net/shark/  Search  Clear

Results in English: 1-10 of 23 found documents

1. Shark Cartilage / Cartilage / Cartilage / Benefin / AE-941 / Neovastat: BC Cancer Agency
   “... There is a protein in cartilage that can inhibit angiogenesis in test tube lab... However, this does not mean that cartilage can fight tumors in the human body. In addition to... results into research on live patients; cartilage has other potential problems. The most serious pr... use. There is no firm evidence that cartilage treatment is effective against... Given the...
   URL: http://www.bccancer.bc.ca/PII/UnconventionalTherapies/Sh...

   “... This trial was unable to demonstrate any suggestion of efficacy for this shark cartilage product in patients with advanced cancer.”
HON Conferences with RSS and PODcast facilities

Consult HON's world-wide database of medical meetings

HONcode sites  All Web sites  HONselect  News  Conferences  Images

Full text search:  Search

Menu

Date

2007
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec

Theme

Alphabet. / Browse

Abdomen (1)
Accreditation (13)
Achievement (1)
Adult (3)
Africa (1)
Age Factors (3)
Aging (14)
Altitude (2)
Alzheimer Disease (4)
American Heart Association (1)
Anatomy (2)
Andrology (1)
Anesthesia (10)
Accessibility: reading comfort + TTS

Trustworthy Internet documents on vision disorders, eye diseases and the prevention of blindness.

- Eye diseases
- Diseases by anatomic structure
- Diseases by age
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- Educational Model
  - Web master education
  - Public education
HON Educational Model

For Web Master

- Educate the Producer community by providing clear guidance and interactive support

For Public

- On www.healthonnet.org some basic guidance is available to the public

For Professional

- HON regularly provides various courses about the health quality assessment on the Internet for medical students and schools of continuing education in Switzerland
Conclusion

- Active for over 10 years
- Trust models at HON cover a large scale of our proposed framework
- Each initiative tries to be as simple as possible from a user’s point of view
- Accreditation model is crucial but should evolve with automatic approaches to address the vastness and the dynamism of the information on the Web
- HON initiatives continue to:
  - promote the quality of health information on the Web
  - educate information producer and consumer to efficiently use the medical information
- Collaboration with Google Coop for disseminating health trustworthy information to more people
Perspectives

- Quality criteria detector will continue to evolve by using merged features and learning data (created by reviewers):
  - Combination of sentence, paragraph and document as a unit of analysis
  - Learning DB from good/bad examples

- HON review will be improved by using automatic system:
  - To prepare the review
  - To automatically survey the evolution of sites

- Integration of trust models in SE and other access models is an important challenge

- Automatic use of literature references to help validate various claims by sites
Readings

Adams S. [2007], “More than just a mouse click: Research into work practices behind the assignment of medical trust marks on the World Wide Web”

Trust marks for the education of the web providers and for a general improvement of the quality of health information on the Web.

Thanks you for your attention!